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ENZOOTIC ABORTION IN EWES—AN INVESTIGATION INTO THE NATURALLY OCCURRING DISEASE

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INTRODUCTION

Following the discovery by Stamp, McEwen, Watt and Nisbet in the spring of 1949, of an organism, characterised by the presence of "elementary bodies," in the foetal membranes of aborted or premature lambs, and subsequent experimental reproduction of the disease, it was suspected that this organism might be the cause of much of the abortion occurring in the south of Scotland. It was decided, therefore, to carry out investigations into as many outbreaks as possible during the 1950 lambing season. The area chosen for the field work was a predominantly sheep farming district, well known to have a high incidence of abortion. It comprised most of Roxburghshire, the south of Berwickshire and the east of Selkirkshire—about 1,500 square miles in all.

Although material containing the characteristic elementary bodies has been received this spring from field cases of abortion in other parts of Scotland, it must be emphasised that the information given in this report refers only to the limited area mentioned above.

I. TYPE OF FARM, BREED OF SHEEP, GENERAL MANAGEMENT OF BREEDING FLOCK

1. LOWLAND

(*a*) *Type of farm.*—These farms consist mainly of arable land, at an altitude of about 200 to 600 feet. The grass upon which the sheep are kept for most of the year forms part of the crop rotation. Permanent grass is usually limited to a convenient paddock near the farmstead. The size of the farm varies from 200 to 800 acres, with a few up to 1,800 acres in extent.

(*b*) *Breed.*—The type of sheep kept is almost exclusively the "half-bred" ewe (Border Leicester ram × Cheviot ewe). These ewes are mated to Oxford, or less commonly, to Suffolk rams for the production of fat lambs, both males and females being sold for immediate or eventual slaughter.

Some farmers run a few Oxford or Suffolk ewes amongst the half-breds in order to provide pure-bred ram lambs for their own use. These pure-bred ewes lamb at the same time as the half-breds.

On a few farms, a registered flock of Oxford, Suffolk or Border Leicester ewes is maintained to produce ram lambs for sale. In this case, lambing takes place in January, or even earlier, and was, therefore, over by the time this investigation was begun.

(*c*) *Management.*—All the half-bred sheep are bought in, either in September as gimmers, or in August the year before as ewe lambs. On many farms the gimmers run with the ewes from mating time (October) onwards, but on some farms, where, for instance, it is the practice to mate the gimmers with the lighter-boned Suffolk rams and the ewes with Oxford rams, or to give the gimmers a little extra feeding, the gimmers may not come into contact with the main body of the flock until after the New Year, when the flock goes on to root-feeding.

Ewes and gimmers run with the rams from about October 12th (October 5th on sheltered farms) for a month or more until all the sheep are seen to have been mated. As the colour of the marking paste spread over the brisket of the rams is changed every week, it is possible to tell to within seven days the expected lambing date of any particular ewe, *i.e.*, which "smote" she is in. If gestation is taken as 21 weeks, the first lambs are expected on or about March 8th (or March 1st). This point is stressed in order to show that it is possible to tell almost exactly, in such a flock, at what stage in pregnancy abortion is occurring.

During and after mating, the ewes run on grass fields usually without any supplementary feeding. From January onwards they are allowed access to a limited area of growing swedes or yellow turnips for a few hours each day. On a few farms the roots may be carted to the field, but the labour involved makes this an uneconomic proceeding. Depending on the general condition of the ewes, a little hay may be fed in racks in the grazing field. During the last few weeks before lambing is due to start a small ration of concentrates (bruised oats, compound sheep nuts, etc.) is usually fed. As this box feeding is continued throughout the lambing period, it means that the ewes lambing latest receive a considerably larger amount of concentrates than those lambing at the start of the season.

A few days before the first lambs are due, the ewes in the first "smote" are drawn out into the lambing field in which there are several straw windbreaks and an elaborate set of lambing pens. Lambing usually takes place in a different field each year, or if the same field has to be used in successive seasons the pens are built in a different part of the field each year. Permanent lambing sheds are rarely seen on this type of farm.

Lambing pens.—These are erected in the weeks immediately preceding lambing and are dismantled as soon as lambing is over. The pens, all facing inwards, are arranged in the form of one or more rectangles. Each pen is of a size sufficient to accommodate one ewe and her lambs. The back, or outer wall of the pen is built either of straw bales or of trusses of the same material firmly bound to a wooden framework. The front of each pen and the partition between adjacent pens consist of wooden hurdles. The pens are covered by a continuous, backwardly-sloping, low straw roof. A thick layer of straw is spread over the whole of the enclosed ground. A plan of a lambing pen of this type is given by Watson & More (1949).

During the day the ewes that are due to lamb that week graze in the lambing field under constant supervision. At night they are brought into the comparatively small space enclosed by the range of lambing pens and are inspected every two hours or so. As soon as a ewe is seen to have lambed, whether by day or by night, she and her lambs

are placed in one of the pens for a period of 24 hours or so, *i.e.*, until the shepherd is satisfied that all is well with dam and young. They are then transferred to the grazing fields, where they will remain throughout the spring and summer until the lambs are ready for sale, and the ewes for drafting (at four or five years old) or preparation for the next mating, as the case may be.

On the farms covered by this survey, some of the pens were almost always occupied by ewes that, having aborted or given birth to dead or weakly lambs, were being persuaded to take another lamb. Where the incidence of abortion and stillbirth is high, this fostering of lambs occupies much of the shepherd's time and would alone necessitate the provision of a certain number of individual pens.

The management of the breeding ewe on these lowland Border farms has been described at some length, because it is possible that there may be a connection between this system of lambing and the high incidence of abortion in this part of the country.

2. Marginal

(*a*) *Type of farm.*—These farms consist partly of arable land and partly of rough permanent grass. The altitude is approximately 500 to 900 feet.

(*b*) *Breed.*—The breed usually kept is the Cheviot, with or without some half-breeds. Some farmers buy in north-country Cheviot sheep, sometimes as gimmers in September, but more often as ewe lambs in August of the previous year, mating all of them with Border Leicester rams and selling all the resultant half-bred lambs—the wether lambs for slaughter or further fattening, the ewe lambs for eventually crossing with a Down ram on lower ground. Others mate a certain proportion of the Cheviot sheep (often the gimmers) to rams of the same breed, keeping the (pure-bred) ewe lambs as replacements for their own breeding stock and therefore not buying in female sheep, except occasionally to make up the numbers.

Many farmers with enough suitable land on a marginal farm make a practice of breeding also, using Down rams, from the half-bred ewes produced by their Cheviot flock.

On the other hand, the rougher marginal farms may be used entirely for breeding Cheviot sheep of the "north country" type (and not be confused with "south country" Cheviots which are very much smaller than the Cheviots commonly used for half-bred lamb production). The breeding of this type of Cheviot sheep is not popular, however, as farmers wishing to breed half-bred lambs apparently prefer to buy their Cheviots from the north of Scotland each year.

(*c*) *Management.*—Half-breds on marginal farms are treated in the same way as on the lowland farms. Generally speaking, the Cheviot ewes on such farms will also use the lambing pens provided for the half-bred ewes.

Where only Cheviot ewes are kept, lambing pens may or may not be provided. In any case, the ewes about to lamb are kept under supervision in a lambing field, from which they are removed to their permanent grazings when they have lambed.

Whether running with half-bred ewes, or kept separately, Cheviot ewes carrying half-bred lambs do not start lambing until about March 16th-25th, depending on the altitude of the farm. Cheviot ewes carrying pure-bred lambs usually start lambing about the end of March.

3. Hill

As only a few hill farms were visited, and as the management of hill sheep varies little from one part of the country to another, a brief description of these farms will suffice.

(*a*) The grazing consists of heather and/or high grass hills on the Scottish side of the Cheviot range. The altitude is about 800 to 1,500 feet. There are usually a few acres of enclosed grass near the farm buildings.

(*b*) *Breed.*—Blackface and Cheviot.

(*c*) *Management.*—On the majority of farms, lambing takes place on the open hill from mid-April onwards. Some farmers make a practice of lambing the gimmers in an enclosed pasture, to reduce the risk of the lamb becoming separated from its dam should the latter's maternal instinct be under-developed. It is rarely considered necessary to keep the ewes under such close supervision. Lambing pens, such as those used on lowland and marginal farms, are almost unknown, but at various convenient points on the hill, and in the lambing field, if one is used, there are a few small open pens or "parrocks," usually stone-built, in which a ewe that has lost her lamb may be confined while being induced to take another lamb. As the percentage of twins, and therefore the supply of extra lambs is small, even these simple pens are only occasionally required.

The ewes are not usually marked weekly at mating time and therefore it is seldom possible to say to less than five or six weeks when any particular ewe is due to lamb, except by noting the degree of development of mammary tissue.

II. Distribution and Incidence

1. Distribution

Table I shows the number of farms visited and the proportion of each type found to be infected. Differentiation between "lowland" and "marginal" farms is sometimes difficult, as many of the large farms include an approximately equal area of both types of land, supporting separate or mixed flocks of half-bred and Cheviot ewes. Moreover, as the northern slopes of the Cheviot Hills rise rather sharply from the undulating arable land lying just south of the lower reaches of the River Tweed, a farm in this area may include two entirely different types of land—arable and heather hill—on which correspondingly different breeds of sheep are maintained as separate flocks, although possibly under the care of the same shepherd. In the one instance where abortion occurred in both flocks they have been recorded separately. In several other cases, as abortion was occurring only in the flock on the arable land, the farm was classified as "lowland."

Table I

Type of farm	Number of farms visited	Number found infected	% found infected
Lowland	74	63	85·1
Marginal	24	14	58·3
Hill	4	—	—

No suggestion is made that these farms represent a true cross-section of Border agriculture. Farms were visited only upon the owners' voluntarily reporting the occurrence of abortion this season. The farms were, therefore, to this extent selected. It must also be mentioned that in the case of the owner of a marginal farm, producing half-bred ewe lambs for sale as future breeding stock, there may have been a certain reluctance to advertise the fact that abortion was occurring in his flock.

Although the total number of sheep on the farms visited represents only a fraction of the sheep population of the district concerned, flockmasters and shepherds almost invariably assure one that there is as high an incidence of

"kebbing" (*i.e.*, expulsion of the living or dead lamb about one to three weeks before term) in neighbouring flocks as in their own. Even after making the necessary allowance for proprietary pride, there seems to be little doubt that, on the lowland farms, if not on the marginal, abortion occurs in a very high percentage of the flocks. Moreover, as the birth of stillborn, weakly or premature lambs is not generally recognised as one of the manifestations of the disease, it is probable that its occurrence is even more common than flockmasters themselves realise.

It should, however, be pointed out that the sole criterion by which a flock was classified as "infected" or "non-infected" was the demonstration in foetal membranes or vaginal swabs of the elementary bodies described by Stamp *et al.* If the shepherd had been unable to recover the foetal membranes, diagnosis may have had to depend upon the examination of vaginal swabs from only a few ewes. Failure to find the characteristic organism in a small number of vaginal swabs from any one farm is no proof that the cause of abortion is not this organism. In at least half of the lowland and marginal flocks recorded as "non-infected," no placentae were available and as the incidence of clinically recognisable disease was low, diagnosis had to rest on the examination of a few vaginal swabs, some of which were not obtained until 24 hours or longer after abortion.

2. Incidence

It was difficult to obtain full information regarding incidence on individual farms. Although shepherds were frank and co-operative in giving details of "kebbing," they do not recognise stillborn or weakly full-term lambs as a sign of the same disease and consequently do not make a mental note of the occurrence, especially as they have so many other matters to occupy their mind when lambing is in progress. A ewe that has had dead lambs is promptly given a foster lamb and as soon as she has accepted it, is sent to an outlying field along with the other newly-lambed ewes. Thus, not only may these stillborn lambs go unrecorded, but the ewe will not be available for swabbing.

It does not necessarily follow that in an infected flock all dead and weakly lambs are the result of this infection, but during examination of placentae from 118 such cases occurring on infected farms, elementary bodies have been demonstrated in 85 of them, i.e., 72·03 per cent. Four of the placentae were too decomposed for examination. The remaining 29 were negative.

Generally speaking, the incidence of "kebbing," as opposed to stillbirths, etc., on infected farms was 2 to 6 per cent. On three farms within a few miles of one another where the disease had occurred at the average level, in several previous seasons, there was an incidence of 8 to 10 per cent. this year for no apparent reason. Neighbouring infected farms showed no such sudden increase. One or two farms reported a rather lower incidence than in previous years.

Many flockmasters stated that they were experiencing the disease this season for the first time, but it is sometimes difficult to accept a statement that there has been no abortion, etc., in former years because on further questioning, many shepherds will admit to having had "one or two" cases of "kebbing" and/or a number of dead or weakly lambs at full-term in previous seasons. Whether or not these were likely to have been caused by this type of infection is a matter of opinion.

When the number of still-born, weakly or premature lambs is included, the incidence of the disease is in most cases approximately doubled.

For obvious reasons it was impossible to conduct an investigation into the incidence of sub-clinical infection, but on one infected farm it was noticed by chance that a placenta newly expelled by a ewe that was suckling a pair of vigorous four-old lambs, was slightly oedematous and the cotyledons much softer than usual, although of normal colour. Microscopical examination showed this placenta to contain large numbers of elementary bodies.

Where the rate of abortion on tick-free land approaches 30 per cent. and there is a history of movement off the home farm during pregnancy, to other than arable land, the possibility of infection with tick-borne fever must be considered. This will be discussed under differential diagnosis.

III. Clinical Picture of the Disease

1. The Foetus

Although it is practically impossible to demonstrate the presence of infection in the aborted foetus, it is useful to be familiar with the appearance of such material, as the placenta, with its characteristic lesions, is rarely found in cases of abortion occurring at pasture or on the turnip field, being carried off almost at once by carrion crows, seagulls, foxes or dogs. The types of foetus met with in infected flocks may be roughly classified as follows:—

(*a*) The "early keb." It is apparently very common in lowland and marginal flocks, for one or two ewes to abort "round about the New Year," *i.e.*, at about mid-gestation. As investigations were not begun until February, no example of this type of foetus was available for examination. In any case it is usually only by the behaviour of the ewe and the presence of some discharge on the tail that abortion is known to have occurred. The few shepherds who have found the foetus at this time of year, describe it as being 3 to 4 inches long, "like a bird," and wholly or partly enclosed in its membranes. This description suggests a semi-mummified foetus, which had died some time before expulsion. Whether this early-occurring abortion is caused by infection it is impossible to say at present. Such abortions were reported to occur on the majority of the farms visited, including at least two where, in spite of the examination of an adequate amount of material, no evidence of the infectious type of abortion could be found. This suggests that these early abortions may be non-specific.

(*b*) The typical "keb." This in its several forms is undoubtedly the best-known manifestation of the disease. Generally speaking, the term "kebbing" is used by flockmasters to describe the expulsion of lambs, either non-viable or in various stages of degeneration, usually one to three weeks, but also at all periods up to six to eight weeks before term. There is great variation in the appearance of these "kebs." Although the majority are expelled at approximately the same time in the gestatory period, *i.e.*, one to three weeks before term, they obviously have either been infected at a different stage in development and/or have been retained *in utero* for varying lengths of time after death.

A few, as mentioned above, are merely non-viable, *i.e.*, although they are usually dead from exposure when found by the shepherd, the appearance of the lungs indicates that they must have lived for at least a few minutes. The majority, however, are born dead—some quite fresh with no obvious abnormality, others fresh but "pot-bellied" on account of an accumulation of blood-stained fluid in the abdominal cavity. Some have obviously been dead *in utero* for days or weeks, as judged by the opacity of the

cornea, the ease with which the wool can be pulled out and the general softness of the tissues. Others, again, are in a remarkable state of degeneration which is unmistakable when once seen. The foetus is about one-half to two-thirds of the size expected in the last month of gestation. The orbits are empty and the rims prominent. The skin, tightly drawn over the body, is almost black and is covered, not with the white curling wool of the late foetus, but with a scanty coat of dark brown hair. There is no appreciable odour. Presumably some degree of mummification has occurred.

It is by no means uncommon for twin foetuses (twins are the rule in half-breds and the North Country type of Cheviot) to fall into different categories. For instance, one of the pair may be non-viable, the other badly degenerated, and so on, in any combination of the above-mentioned types of foetus.

(*c*) Premature lambs, *i.e.*, born a few days before term. If such lambs are brought under cover immediately after birth, they have a good chance of survival, but if there is a delay and if the weather is cold, the more premature may have died by the time they are found. Premature lambing was a common occurrence this season in infected flocks. In one case nearly 50 per cent. of the ewes due to lamb in the first week produced apparently normal lambs at least three to four days before term. The shepherd was emphatic that no mistake had been made in the date of putting out the rams. Although flock-masters, as already explained, had not given much notice to this occurrence in previous seasons, especially when there was no loss of lambs or ewes they were able to say that premature lambing is common in many flocks where " kebbing " also occurs.

(*d*) Dead or weakly lambs born at or just before full term are also common in infected flocks. The dead lambs are often fresh, but may show degeneration to a degree varying from corneal opacity at birth to such a generalised softening of the tissues that the limbs and head are easily pulled away from the body when traction is applied at an assisted lambing. These " rotten lambs " are well known to shepherds.

Those weakly lambs that are born just before full term are not to be confused with those described as " premature lambs." Although naturally less hardy than a normal lamb, the premature lamb will usually survive with a little nursing or may even require no special attention. The weakly lambs born at or just before term, however, are often " pot-bellied," with or without some subcutaneous oedema. They make little or no attempt to feed from their dams. Even when brought into a warm atmosphere and hand fed, they rarely survive for more than a day or two, They are familiar to Border shepherds under the name of " soft lambs."

(*e*) The birth of one normal lamb at full-term immediately preceded or followed by a recently dead or degenerating twin is one of the clinical features of the disease, and yet was apparently seldom recognised by flockmasters as such. " Rotten lambs " were accepted as one of the misfortunes of lambing and were rarely associated with " kebbing." In the great majority of instances, the dead lamb is either fresh, or degenerating only to the extent found in the usual type of " keb," but in three of the cases seen, the dead twin took the form of a mummified foetus, in each case about 6 inches long (crown-rump) and enclosed in its own correspondingly mummified membranes. In two cases the living twin was normal. In the third case, although born like the others at full term, it died within an hour or two. In this latter case, elementary bodies were demonstrated in the mummified membranes. The other two were doubtful and negative respectively. The finding of elementary bodies in the membranes surrounding a 6-inch foetus is particularly interesting in view of the occurrence of abortion at approximately mid-gestation (" early kebbing "), but as only one such example was encountered, no conclusions can be drawn at present.

Where triplets are born, as is not uncommon amongst half-breds, it is well known by shepherds that two lambs may be normal and one degenerating or vice versa.

(*f*) Finally, mention must be made of two somewhat unusual occurrences. In one case, a degenerating foetus was expelled about 14 days before term to be followed at term by a weakly " pot-bellied " lamb, which died almost at once. No material from the first foetus was available, but the placenta of the second lamb was found to be infected. In the other case, one foetus was expelled approximately ten weeks before term and was followed by a normal lamb at term. This also occurred in a flock known to be infected, but was not reported until it was too late to take a swab from the ewe.

No material was available from group (*a*), while group (*f*) is too small to be of significance, but a large number of foetal membranes and vaginal swabs was examined from the remaining groups. As swabs are not a reliable means of diagnosis, they cannot be used for comparative work within a flock, but the results of the examination of 194 placentae, obtained from over 70 *infected* flocks, are given in Table II.

Table II

Group	Number of placentae examined	% found infected	% found not infected	% too degenerate for diagnosis
b	76	69·9	18·3	11·8
c, d, e	118	72·0	24·6	3·4

Groups c, d and e are recorded together as the distinction between these groups is arbitrary and cannot always be maintained.

2. The Ewe

(*a*) General effect on health. With a few exceptions flockmasters were agreed that " kebbing " has a more or less unfavourable effect on the health of the ewe. Many shepherds claim to be able to pick out infected ewes a few days, or even a week or two, before they abort on account of their being in poorer condition than their flockmates. It was mentioned by several shepherds that ewes often had " dirty tails " before they aborted. Several such ewes were examined. There was a considerable vaginal discharge, which contained the characteristic elementary bodies. The ewes aborted about 24 to 48 hours later.

As each ewe's condition was assessed, in the customary way, at the time of swabbing, it is possible to say that the majority of the aborting ewes were much leaner than one expects to find lowland sheep after an exceptionally mild winter. Unfortunately it was seldom practicable to compare the condition of the aborting ewes with that of their normal, pregnant flockmates, but there is no reason for not accepting the shepherd's statement that the other ewes were in good lambing condition.

After abortion, there is a varying amount of vaginal discharge, depending mainly on the degree of retention of the placenta (see below). When the placenta is expelled within a few hours, the amount of discharge is no greater

than after a normal parturition. When the placenta is retained for two to three days as is very common, the subsequent discharge may continue for several days, but it was rare to find elementary bodies in a swab taken more than 48 hours after the placenta had been completely expelled. For the first few days after abortion the ewe is dull, the wool lacks lustre and the face loses the clear whiteness of that of the healthy sheep. Although behaviour returns to normal within a few days, the leanness persists for two to three weeks, after which the ewe begins to thrive, and can readily be fattened for slaughter if so desired.

A few farmers say that their ewes take as long as eight weeks to recover from the effects of abortion, while others maintain that the effect on general health is slight—the ewe is normal again within a week. Only one declared that his ewes were totally unaffected by abortion. They remained in good condition both before and after abortion. There was no doubt about the presence of infection in this flock.

The above observations refer only to ewes aborting before the start of the lambing season, when, as no use can be made of them as foster dams, they are separated from the pregnant ewes and allowed to run at grass with the rams or the young stock. When abortions occur after the lambing season has started, such ewes are brought in from the pasture, and if the udder is sufficiently well developed, as it usually is, they are given a lamb to nurse. If they take the lamb readily and are returned to pasture within a matter of hours, no harm results, but if they require more persuasion and have to be closely confined for up to three days in one of the small lambing pens, the loss of condition may be serious. This is so well recognised that some shepherds are most reluctant to give an aborting ewe a foster lamb, but the majority evidently consider it necessary, where the crop of lambs is heavy. A few owners of badly infected flocks actually make a practice of arranging for a certain number of ewes to lamb about a fortnight earlier than the rest of the flock so that twins from the early-lambing ewes may be split to provide lambs for the ewes that abort, on the principle that it is better to have two ewes suckling a lamb apiece than one with twins and one with none.

Mortality amongst aborting ewes rarely exceeds 10 to 15 per cent., *i.e.*, less than 1 per cent. of the total number of ewes in the flock. In many of the flocks under observation no deaths occurred, although there was the average number of abortions. Some ewes may die a few days after aborting, whereas others may " pine " for several weeks before death occurs. One or two farmers have mentioned that, after aborting, ewes may " pine " for perhaps six weeks and may then start to thrive, but if this coincides with the spring flush of grass, several of them may be found dead. Such mortality is only incidental, as sudden death may occur in any thriving sheep.

Retention of the placenta.—After abortion, the placenta is often retained for two to three days, sometimes as long as seven to ten days. Most shepherds say that such retention aggravates the effect produced by abortion on the general health of the ewe. On any particular farm, therefore, some ewes will be more seriously affected than others, despite identical conditions of feeding and management.

Retention of the placenta is less common and of shorter duration after the birth of premature, stillborn or weakly lambs.

The high incidence of retention of the placenta is not peculiar to this type of abortion. It has been observed, for instance, in abortion occurring as a result of initial infection with tick-borne fever.

The above observations on mortality refer only to abortion and premature lambing. When the disease causes the death of lambs at full term, mortality among the ewes may be high. This is probably explained by the fact that, when the foetus is dead, dystocia is more likely to occur, necessitating an assisted delivery. As some shepherds fail to take even the most elementary precautions against the spreading of infection from ewe to ewe, secondary metritis may account for many of the deaths in such cases.

(*b*) Immunity. Flockmasters in this district are almost unanimous in their opinion that ewes that have aborted or lambed prematurely will not do so a second time. For reasons already given, no information is available regarding the breeding history of ewes that produce dead or weak lambs.

On one infected farm several of the ewes aborting this year were definitely known to have aborted last year. Further investigation revealed strong circumstantial evidence that the majority of the abortions on this farm last year were caused by an initial infection with tick-borne fever.

Another farmer declared that one year he had marked thirty aborting ewes of which six " kebbed " again in the following year, and 14 had one living and one dead lamb, the remaining 10 being barren. Although there is no doubt that enzootic abortion is now present in this flock, this clinical history differs so much from that of neighbouring flocks in this and other respects that the existence of this type of infection in previous years must remain open to question.

(*c*) Fertility. As in the case of immunity, investigations in this district, with one exception, confirm the statement of Stamp *et al.* that sterility is not a sequel to the disease. Their remark that ewes that have aborted conceive " without difficulty " requires a little qualification. If a ewe has aborted too early to be given a foster lamb, there is a danger that during the summer, with no lamb to nurse, she may become too fat to conceive readily. This temporary infertility, of course, is purely incidental and may be avoided by appropriate management.

The one exception is again the case of the farmer who, as already mentioned, marked 30 aborting ewes one year. Ten of these were barren in the following year.

(*d*) Age incidence. The figures given in Table III refer to ewes in the 77 lowland and marginal flocks where infection has been proved to exist. Not all of these ewes were examined individually. Where several abortions had occurred within a few days of one another amongst ewes kept under identical conditions, the age and lambing date of each ewe were noted, but swabs were obtained only from the two or three most recent cases. It was felt safe to assume that the rest had been infected with the same organism. When premature, stillborn or weakly lambs were involved, however, every such case was examined individually and only those found to be infected were included in the numbers given in Table III.

It will be seen that, on the whole, abortion, premature lambing, etc., are commonest in ewes carrying their second crop of lambs, but are also common in ewes carrying their first and third crop of lambs respectively. The low number of fourth crop ewes found infected is partly explained by the smaller total number of these older ewes in the flocks under observation. Generally speaking, half-bred ewes are drafted after they have had their third crop of lambs, but in some half-bred flocks and the majority of Cheviot flocks kept for half-bred lamb production, they are drafted after the fourth crop. This, combined with the normal wastage

Table III

Ewes Found or Assumed to be Infected

Age of ewe	Number found infected	% of total
First crop*	198	26·6
Second crop	271	36·5
Third crop	203	27·3
Fourth crop	58	7·8
Fifth and sixth crop	13	1·7
Total ...	743	

* In this district, a ewe has her first lamb at two years of age.

from accident, other diseases, etc., means that the number of fourth crop ewes under observation was considerably lower than that of any one of the three younger ages, and, therefore, that the incidence in this age group was a good deal higher than the figures in the table suggest. Even so, it is probable that abortion is less common in this group of ewes.

The figures for fifth and sixth crop ewes are of little significance, except in so far as they show that age *per se* is no proof against infection. Fifth and sixth crop ewes were encountered only on certain farms, and as details of total numbers of each age group on such farms were not always available, it is not clear whether the proportion of abortions in these old ewes was greater or less than that in the young ewes, although one is tempted to assume that the latter is the case.

(*e*) Method of spread of infection. In a heavily infected district such as this, where there is continual movement of stock to and from breeding farms, clinical evidence on this point is often contradictory and incomplete. No conclusions can be reached at present regarding the means by which infection is spread from sheep to sheep or from flock to flock.

3. The Placenta

The appearance of the diseased placenta has already been described and illustrated by Stamp *et al.* Owing to practical difficulties of collection, only about 76 sets of foetal membranes were obtained from cases of " kebbing " compared with 118 from ewes that had given birth to premature, stillborn or weakly lambs. Further, when the placenta was retained after an abortion occurring at pasture, it was usually considered better to cut off part of the exposed membranes than to depend upon their being later collected intact by the shepherd. As the principal reason for retention of the placenta is probably the diseased condition of certain of the cotyledons, and as these diseased cotyledons will be the last to separate from the uterus, this may explain the rather low percentage (see Table II) of placentae found infected in cases of " kebbing " in infected flocks. It may also partly account for the fact that although an infected placenta almost invariably showed macroscopic necrosis of the cotyledons as described, extensive thickening and corrugation of the inter-cotyledonary tissue was by no means a constant sign. Necrotic thickening of the chorion was often confined to a small area immediately surrounding the base of a necrotic cotyledon. Only a few membranes showed an extensive area of leathery thickening or corrugation between the cotyledons, but an oedematous condition of this part of the membrane was common.

A further type of placental abnormality occurring in infected flocks was a very advanced state of degeneration, not putrefaction, present at the time of expulsion. The membranous part of the placenta is dry, grey and opaque, and all the cotyledons are clay-coloured and shrunken. Such a placenta, as might be expected, usually accompanies a very degenerate, often semi-mummified, lamb. Microscopical examination failed to reveal the characteristic elementary bodies, but it was common to find numerous faintly staining groups of ill-defined structures which may well have been degenerating elementary bodies in the process of losing their characteristic acid-fastness. Similar placentae were obtained from at least two of the farms classified as " non-infected." These also showed the faintly staining groups, but as this was not considered diagnostic, these farms were left in the " non-infected " category. It may, however, be mentioned that a placenta macroscopically indistinguishable from the type just described was recently obtained from one of the experimentally infected ewes at this Institute. In addition to the faintly staining groups, there were unmistakable groups of elementary bodies.

In view of the fact that the foetus may be expelled at various stages in development and may show wide variation in the degree of degeneration, it is not surprising that there should be a certain variation in the nature and extent of the placental lesions.

Although invariably confirmed or refuted by microscopical examination, diagnosis in the field could be made with some accuracy on the macroscopic lesions alone. There did not appear to be a direct relationship between the extent of the macroscopic placental lesions and the degree of degeneration of the foetus.

IV. Differential Diagnosis

1. Other Infectious Types of Abortion

Greig (1936) reported that in the course of investigations into enzootic abortion of ewes in Scotland, no serological evidence was obtained of the presence of infection with *Vibrio foetus*, *Salmonella abortus-ovis*, or *Brucella abortus* and that bacteriological examination of the stomach contents and heart-blood of aborted foetuses had failed to reveal the presence of any significant organisms.

Stamp *et al.* (1950) reported that cultural and microscopical examination of numerous aborted foetuses and premature lambs from tick-free flocks in the south-east of Scotland had failed to reveal evidence of any bacterial infection.

It therefore appears unlikely that either *Vibrio foetus* or *Salmonella abortus-ovis* is a cause of abortion in this district.

2. Non-specific Abortion

Flockmasters are emphatic that rough treatment of heavily pregnant ewes, *e.g.*, crushing of sheep through a gateway, hounds going through a flock, etc., can cause abortion with or without the death of the ewe. Abortion from such causes is said to occur within seven to 14 days. In a district where infectious abortion is so common, however, such statements must be accepted with reserve.

One outbreak of abortion, or rather stillbirth, was encountered that seemed undoubtedly to be the result of an accident. On March 22nd 100 Cheviot ewes, due to start lambing in about ten days' time, were involved in a road accident, in which two ewes were killed and 60 others crushed, some of them almost to the point of suffocation. The first stillbirth occurred on April 5th, 13 days after the accident, to be followed by five or six others during the following week. All the lambs appeared to have died only recently and no evidence of infection was found.

In such a case the history is of major significance although the possibility of tick-borne fever is not necessarily eliminated.

3. Tick-borne Fever

In this district, where tick-free and tick-infested pastures are found within a few miles of each other, any severe outbreak of abortion in a flock thought to be tick-free following a change of grazing during pregnancy must be regarded with suspicion (Stewart (1936), Harbour (1945), Jamieson (1950) and Stamp and Watt (1950)). Diagnosis depends upon the demonstration by lamb inoculation of the presence of the organisms of tick-borne fever in the blood of sheep that have been away during pregnancy and of their absence by the same test from the blood of animals of the same flock that have not been off the home pastures. In the three outbreaks encountered during the course of this investigation abortion occurred 12 or more days after exposure to tick-bite. Up to 39 per cent of the animals so exposed aborted and mortality was high.

It is hoped to publish a separate note on this subject later.

4. Undiagnosed Cases

At least two types of outbreak were encountered that could not be explained. In a comparatively small flock on tick-free land, about 10 per cent. of the ewes due to lamb in the last week of the season produced dead lambs. Only one ewe had aborted before the start of the lambing season this year, but as this abortion had not been reported at the time, the animal had not been examined. The average incidence of "kebbing" in previous years was said to have been 5 per cent. Microscopical examination of numerous placentae and bacteriological examination of the stomach contents of the dead lambs failed to reveal a cause for this outbreak of stillbirth, which was clinically similar to some of those of the infective type under investigation.

In another group of four outbreaks, two occurring in hill flocks and two on marginal land, approximately 10 per cent. of ewes of all ages aborted or lambed prematurely. No infection could be found in the placentae and there was no history of movement from the home farm during pregnancy. Tick-borne fever could not be incriminated owing to the lack of controls, but was strongly suspected in one of the four flocks. These cases will also be dealt with in the note on tick-borne fever.

Summary

An account is given of an investigation into 102 outbreaks of ovine abortion occurring in a district of south-east Scotland.

The three main types of farm and the system of sheep husbandry used on each type are described with particular reference to the management of the breeding ewe.

The distribution and incidence of "enzootic abortion" are given for each type of farm.

The clinical picture of the disease is described in relation to the foetus, the dam and the placenta respectively.

Differential diagnosis is briefly discussed, tick-borne fever being an important consideration in the district concerned.

Acknowledgments.—I am grateful to Dr. A. D. McEwen for constant advice and interest during the course of this investigation.

I also wish to thank Mr. J. B. Dow for technical assistance and Miss I. Armstrong and Miss H. McLeish, of Kelso, for much voluntary assistance in the organisation of the field work.

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TICK-BORNE FEVER AS A CAUSE OF ABORTION IN SHEEP

BY

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Tick-borne fever as a cause of abortion in sheep has already been described by Stewart (1936), Harbour (1945), Jamieson (1950) and Stamp & Watt (1950), but as references to this type of abortion are not numerous it may be of interest to record the following observations, which were made during the course of a recent investigation in the south-east of Scotland into the distribution of the type of infectious abortion described by Stamp *et al.* (1950), when at least three outbreaks of abortion were encountered that could be attributed to infection with tick-borne fever.

In each case there was a history of movement during late pregnancy from tick-free to tick-infested land, the incidence of abortion was in the region of 30 per cent. and the mortality amongst aborting ewes was high. These clinical findings are strikingly different from those described by Littlejohn (1950) and in no case was there found evidence of infection of the placenta with the elementary bodies described by Stamp *et al.* It was, however, demonstrated by microscopical and/or biological examination that the organisms of tick-borne fever were present in the blood of aborting ewes and absent from that of other members of the flock that had not been on the tick-infested pastures.

There was no history of abortion in previous years except in Case 3, where it was reported that every year a few sheep, usually gimmers, aborted at about the beginning of January.

Case 1

On January 30th a flock of 262 half-bred ewes, due to start lambing on March 16th, was sent from a tick-free marginal farm to another farm comprising a small amount of arable land, some marginal land and a heather hill. Both of the latter parts of the farm were known to be tick-infested. The ewes were allowed access to a limited area of growing turnips each day and at night were run-off on to a rough permanent pasture. On two nights only—February 13th and 14th—they were allowed to run on the hill grazing.

They were walked back to their home farm—a distance of two and a half miles—on February 18th, by which time several abortions and two deaths had already occurred. The outbreak continued at the home farm, until by the second week in March a total of 62 ewes had aborted, 14 of which had died shortly afterwards.

On March 7th, samples of blood were obtained from three of the aborting ewes and a bulked sample was inoculated into a healthy lamb. Five days later this lamb showed a temperature of 107·6° F., accompanied by the presence of tick-borne fever organisms in the bloodstream.

Samples of blood from three ewe hoggs which had never been away from the farm were similarly bulked and injected into a lamb with a negative result.

CASE 2

This outbreak occurred in a well-managed flock of 400 north-country Cheviot ewes. The flock was kept under the usual system of husbandry on a marginal farm known to be free from tick-infestation.

On February 4th, 300 ewes of all ages due to start lambing on March 22nd were sent to farm A, where they were folded on swedes, with a run-off on to a pasture that was said to be tick-free although the geographical position of the farm casts some doubt upon this statement. Hay was provided in racks on this pasture. It is a common practice to feed and manage heavily pregnant ewes in this way.

After three weeks on farm A, *i.e.*, on February 25th, the ewes went to another farm, B, where again they had swedes, hay and a run-off on to pasture, but in this case it consisted of rough permanent grass adjoining a hill known to be tick-infested.

After two weeks on farm B, *i.e.*, on March 11th, they were walked slowly home, a distance of about three and a half miles.

By this time (March 11th) abortions had already started to occur. There had been two on March 10th and two previous to that. Five more ewes aborted on March 12th, and thereafter abortions occurred at the rate of 10 to 15 per day, to a total of 117. In addition, many of the full-term lambs were weakly at birth. Only one abortion occurred amongst the 100 pregnant ewes kept at home and all the lambs were born in a normal vigorous condition. All the aborting sheep were dull and in poor condition at and for varying lengths of time after abortion. Retention of the placenta was common. Twenty-seven of them died within a few days; the rest could easily be distinguished from the unaffected portion of the flock for at least a month afterwards by the lustreless condition of the fleece and the loss of the clear whiteness of the skin of the face that is indicative of good health. The aborted lambs were either apparently newly dead or died within an hour or two after expulsion.

Samples of blood were obtained on March 17th from eight ewes that had aborted within the preceding 48 hours. In four of these samples, the organisms of tick-borne fever were so numerous that they could be demonstrated by direct microscopical examination. Inoculation of a bulked sample of this blood into a lamb produced the characteristic high temperature (107·6° three days after inoculation) with large numbers of organisms in the bloodstream. A bulked sample of blood from six of the 100 pregnant sheep that had not been off the farm was found negative for tick-borne fever on injection into a lamb.

The temperature of ten aborting ewes was recorded about half an hour after the taking of blood samples from eight of them. Three which had aborted within the previous ten hours had a temperature of 106·6, 105·3 and 103·2 (not bled) respectively. In three which had aborted about 24 hours previously the temperature was 105·0, 103·8 and 103·8 respectively. The remaining four which had aborted about 48 hours previously showed a temperature of 105·8, 105·5, 104·9 and 104·0 (not bled) respectively. Moreover, there was no apparent relationship between the height of the temperature and the finding of tick-borne fever bodies by direct microscopical examination. The degree of pyrexia is evidently of little value in differential diagnosis.

CASE 3

This outbreak occurred on a tick-free marginal farm and involved only the ewes due to lamb in the third week of the lambing period, *i.e.*, the ewes of the third "smote." On March 2nd, 73 half-bred ewes due to start lambing on April 2nd were sent to a marginal farm, where they received the usual feeding of roots and hay with a run-off on to a low-lying field, which, however, was adjacent to a rough permanent pasture, which in turn adjoined a tick-infested hill grazing. On March 23rd the ewes were brought back by motor lorry, a distance of about 12 miles. They were said to have been carefully handled throughout the journey.

Two stillbirths occurred on March 31st, and thereafter two to three ewes produced dead lambs every day to a total of 20 by April 7th. All the lambs appeared to have been dead *in utero* for at least some days. Several of the ewes died, but as nearly all of those producing dead lambs had been assisted, the cause of death is a matter of opinion.

The other two "smotes" consisted of 367 ewes, that had also been away from the farm, but they had been on arable land for three weeks from the end of January to the middle of February, and had all produced normal lambs at full term, *i.e.*, during the latter half of March.

Samples of blood were obtained from three ewes which had recently given birth to dead lambs. The organisms of tick-borne fever were demonstrated by direct microscopical examination in one of these samples. A bulked sample of blood from six ewes from the first and second "smotes" was found negative for tick-borne fever when inoculated into a lamb.

The significant details of the above three outbreaks are summarised in the accompanying tables.

It would appear that abortion resulting from an initial infection with tick-borne fever may occur from 12 to 29 days after exposure to tick bite. It is interesting to note that in Case 3 where the longest period elapsed between exposure to infection and the occurrence of the first abortion, the aborted foetuses appeared to have been dead *in utero* for some time, whereas in Case 2 the foetuses were either living at the time of expulsion or appeared to be newly dead.

The fact that in Cases 1 and 2 the outbreak had already started before the ewes were brought home is a strong argument against the possibility that the excitement and fatigue of the journey were even precipitating factors in the occurrence of abortion.

Apart from the three above-mentioned cases, in which there is little doubt that an initial infection with tick-borne fever was the cause of the outbreak, at least three other outbreaks of abortion were encountered on marginal land where there was no history of movement during pregnancy, but it was suspected that, as the pastures were only lightly infested with ticks, some of the ewes might have escaped being bitten as lambs or gimmers and were thus experiencing infection for the first time in their lives during pregnancy (Harbour, 1945; Stamp & Watt, 1950). This theory could not be proved as there is no cheap and simple method of diagnosing tick-borne fever in individual sheep. An attempt was made to obtain groups of control sheep that were less likely to have been exposed to tick bite than the aborting ewes, but in two cases not only the blood of the aborting sheep but also that of the controls was found infective on lamb inoculation. In the third outbreak, however, which occurred in a flock of 950 ewes on a farm thought to be free from ticks, a bulked sample of blood from five of the 23 aborting ewes was found positive for tick-borne fever by lamb inoculation, whereas a bulked sample of blood from six home-bred ewe hoggs taken at random from 250 of the same age was proved negative by the same test. This suggests that the pastures were only lightly infested with ticks and that many of these ewe hoggs would probably still not have experienced a tick bite before reaching breeding age in about eight months' time.

Initial infection with tick-borne fever was again suspected in a seventh outbreak of abortion, occurring on a heavily

TABLE I

Case	Date of arrival on tick-infested land	Date of return to home farm	Date of first abortion	Date on which lambing was due to start	Period between arrival on tick-infested land and occurrence of first abortion
1	Jan. 30th*	Feb. 18th	Feb. 13th	Mar. 16th	14 days
2	Feb. 25th (? Feb. 4th)	Mar. 11th	Before Mar. 10th	Mar. 22nd	c. 12 days (? 33 days)
3	Mar. 2nd	Mar. 23rd	Mar. 31st	Apr. 2nd	29 days

* It must be remembered that the winter of 1949–50 was exceptionally mild.

TABLE II

Case	Total number of ewes involved	Number of abortions or stillbirths	% of abortions or stillbirths	Number of ewes dying after abortion	% of ewes dying after abortion
1	262	62	23·7	14	22·6
2	300	117	39·0	27	23·1
3	73	20	27·4	4 or 5	25 or 20

tick-infested hill farm, amongst sheep that had been purchased as non-pregnant adults from tick-free land in the previous October. By the time this outbreak came under observation, the spring " rise " of ticks had already occurred. It would thus have been of no value to take samples of blood from aborting ewes in view of the absence of controls. It was hoped that samples of blood could have been obtained from some ewes immediately after abortion, in order to try to demonstrate the presence of the organism of tick-borne fever by direct microscopical examination, which would have indicated a recent infection. Such samples unfortunately were not obtainable, and the cause of the outbreak remains a matter for conjecture.

These last four outbreaks are mentioned to illustrate the fact that abortion attributable to initial infection with tick-borne fever may possibly occur even where the characteristic history of movement of the flock during pregnancy is absent.

Acknowledgment.—I am indebted to Dr. A. D. McEwen for supplying the details of the outbreak recorded under the heading of " Case 1," and also for carrying out all the diagnostic inoculations mentioned in this report.

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The experiences of the last war must still be fresh in the mind of the Ministry of Agriculture and it is hoped that this Department will stake the claim of farming before the Ministry of Supply places contracts for war materials on a cost of production plus basis to the detriment of materials that are the life blood of agriculture. —*Farmer and Stock-Breeder.*

DISTAQUAINE (Procaine Penicillin G) SUSPENSION: BLOOD LEVELS IN CATTLE

BY
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AND
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Penicillin now has a considerable field of use in the treatment of general systemic infections of animals. It is generally given by subcutaneous or intramuscular injection. The use of the soluble sodium and calcium salts in aqueous solution had the disadvantage that frequent injection was necessary to maintain bacteriostatic levels in the blood, and the position was only slightly improved when oil-wax preparations of these salts were used. Slavin (1946) reported on blood levels obtained in cows with aqueous solutions of sodium penicillin and oil wax preparations of the calcium salt. For the latter he recommended a dose of 1,000,000 units to be given every 12 hours. Kelly & Bell (1947) carried out blood level estimations after injecting sodium or calcium penicillin in various vehicles and in a range of doses. They suggested 2,000,000 units every eight hours for the treatment of systemic disease in cattle. Further disadvantages of oil wax preparations are the difficulty experienced in injecting them and the pain which is sometimes caused at the site of injection.

The use of the sparingly soluble procaine salt in the form of a suspension injected intramuscularly to form a depot from which penicillin is slowly released over a prolonged period was expected to reduce the frequency of injections required. Suspensions of procaine penicillin in oil are being used in animals but we have seen no published reports concerning the blood levels produced. The present paper deals with an aqueous suspension of procaine penicillin supplied by the Distillers Company (Biochemicals) Ltd. under the name " Distaquaine." In our experience it is very convenient to use and has caused no pain or local reaction on injection in cattle. Cohen (1950) has reported on its use in a series of human volunteers and was able to maintain an effective blood penicillin level of over 0·03 units per ml. for 24 hours in 27 out of 30 cases after a single intramuscular injection of 300,000 units.

The results of the series of tests described here show that in cattle also it is possible with a single injection of Distaquaine suspension to maintain detectable blood concentration over a 24-hour period. The use of the preparation in practice should therefore offer considerable saving in time and labour due to the reduced frequency of administration required.

MATERIALS AND METHOD

Distaquaine suspension is stated to contain in each ml. procaine penicillin G equivalent to 300,000 I.U., plus sodium citrate not more than 3 per cent. w/v, a suspending agent not more than 1·5 per cent. w/v, and phenyl mercuric nitrate 0·002 per cent. w/v in an aqueous vehicle.

The suspension was administered intramuscularly to cows and calves in the gluteal region as a single injection and blood samples were collected from the jugular vein at intervals thereafter. Several animals were used more than once with intervals of a week or more between tests. No difficulty was encountered in making the injections and no pain nor other local reaction was observed.

The bacteriostatic effect of the serum taken after dosing was estimated by Fleming's slide cell technique using defibrinated bovine blood as the medium and the Oxford

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(penicillin-sensitive) strain of *Staphylococcus aureus* as test organism. The results were calibrated against a standard of sodium penicillin G using the same technique. With this method the lowest concentration of penicillin detectable was approximately 0·03 unit per ml. and as the test serum requires to be diluted at least 50 per cent. it follows that the minimum detectable serum level was 0·06 unit per ml. Levels of 0·06 unit per ml. and over are generally accepted as being adequate for therapeutic purposes in treating sensitive infections. Estimations of concentrations below the level of 0·06 or 0·03 are in any case difficult to interpret owing to the normal bacteriostatic effect of fresh serum. We were able to demonstrate this in normal bovine serum using a tube dilution method in broth.

Results

The results of the series of assays carried out in both cows and calves are shown in the table.

frequent sampling (usually six or eight hours after dosing). At the 24th hour after injection penicillin activity was still detectable in eight of the eleven cases.

Two cows were given injections of 5 c.c. which represented 3,000 to 3,500 units per kg. In one of these no penicillin was detectable at either 18 or 24 hours after dosing, in the other a level of 0·06 unit per ml. was recorded at each of these times.

These results in cows appear to be comparable to those obtained in man by Cohen (1950).

A total of 14 tests were done in calves, eleven of them in animals of under two months of age. The lowest dose used was 10,000 units per kg. bodyweight and this gave a level of 0·06 unit per ml. or over at the 24th hour in nine of the eleven tests, including three animals of three months of age. The two calves in which penicillin was not detectable at the 24th hour were two and a half weeks and five weeks old.

Two calves (aged two and a half weeks) were given doses of 15,000 units per kg. and in only one of them was an effective

Distaquaine Suspension—Blood Levels in Cattle

Name or number of animals	Dose in units per kg.	Dose in c.c.s.	Serum concentration (units per ml.) Hours after dosing ½	1	2	3	4	6	8	12	18	24	28	36	48
Cows:															
Spot	6–7,000	10	0·5	0·5	0·5	0·5	0·5	0·5	0·5	—	—	0·5	0·5	—	0·5
Jill Minor	5–6,000	10	0·12	0·12	0·25	—	0·25	0·25	0·25	—	—	<0·06	—	—	—
Patricia	9–10,000	20	0·5	0·5	0·25	—	0·25	0·5	—	—	—	0·25	—	—	—
Spot	9–10,000	15	—	—	—	—	—	—	—	2·0	1·0	—	—	0·25	—
Dollar	5,000	7·5	—	0·25	0·25	—	0·5	0·5	—	—	—	0·06	—	—	—
Brandy	5–6,000	10	—	—	—	0·5	—	1·0	—	—	—	<0·06	—	—	—
Jill Minor	5–6,000	10	—	—	—	0·5	—	0·25	—	—	—	0·06	—	—	—
Button	5–6,000	10	—	—	—	0·25	—	0·25	—	—	—	<0·06	—	—	—
Diadem	5–6,000	10	—	—	—	0·25	—	0·25	—	—	—	0·12	—	—	—
Silver	5–6,000	10	—	—	—	1·0	—	0·5	—	—	—	0·06	—	—	—
Patty	5–6,000	10	—	—	—	0·5	—	0·5	—	—	—	0·06	—	—	—
Patch	5–6,000	10	—	—	—	0·5	—	0·5	—	—	—	0·12	—	—	—
Honeysuckle ...	5–6,000	10	—	—	—	0·25	—	0·5	—	—	—	0·06	—	—	—
Spot	6–7,000	10	—	0·5	—	—	—	—	—	—	0·12	0·06	—	—	—
Barley	3,000	5	—	0·25	—	—	—	—	—	—	<0·06	<0·06	—	—	—
Dollar	3,500	5	—	0·12	—	—	—	—	—	—	0·06	0·06	—	—	—
Calves:															
F.12 (2½ weeks) ...	15,000	2	4·0	—	—	—	—	2·0	1·0	—	—	<0·06	—	—	—
F.13 (2½ weeks) ...	15,000	2	1·0	2·0	2·0	—	2·0	2·0	1·0	—	—	0·125	—	—	—
F.14 (2½ weeks) ...	20,000	2·7	4·0	4·0	2·0	—	2·0	2·0	0·25	—	—	0·125	—	—	—
F.7 (3 months) ...	10,000	2·5	—	—	—	—	—	—	—	—	0·12	0·06	—	—	—
F.8 (3 months) ...	10,000	2·5	—	—	—	—	—	—	—	—	0·12	0·06	—	—	—
F.9 (3 months) ...	10,000	2·5	—	—	—	—	—	—	—	—	0·12	0·12	—	—	—
F.12 (5 weeks) ...	10,000	1·5	—	—	—	—	—	—	—	—	0·12	<0·06	—	—	—
F.15 (2½ weeks) ...	10,000	1·5	—	—	—	—	—	—	—	—	<0·06	<0·06	—	—	—
F.13 (6 weeks) ...	10,000	1·7	—	—	—	—	—	—	—	—	0·12	0·06	—	—	—
F.14 (6 weeks) ...	10,000	1·7	—	—	—	—	—	—	—	—	0·12	0·06	—	—	—
F.15 (3½ weeks) ...	10,000	1·3	—	—	—	—	—	—	—	—	0·25	0·12	—	—	—
RJ.15 (2 weeks) ...	10,000	1·3	—	—	—	—	—	—	—	—	0·12	0·06	—	—	—
F.12 (8 weeks) ...	10,000	1·8	—	2·0	—	—	—	—	—	—	0·06	0·06	—	—	—
F.16 (2½ weeks) ...	10,000	1·3	—	1·0	—	—	—	—	—	—	0·12	0·12	—	—	—

Discussion

Satisfactory serum penicillin levels were observed within half or one hour of injection in both cows and young calves, indicating that absorption takes place rapidly after injection.

In cows a total of 16 tests were done. The highest dose used was approximately 10,000 units per kg. bodyweight and the maximum serum level recorded with this dose was 2 units per ml. at the 12th hour in one cow. A level of 0·25 unit per ml. was still present in this cow at the 36th hour.

In eleven of the tests the dose given was 10 c.c., representing on an average 5,000 to 6,000 units per kg. With this dose the highest serum level recorded was 1·0 unit per ml. Comparatively uniform levels persisted over the periods of level present at the 24th hour. A third calf received the highest dose used which was 20,000 units per kg. The maximum serum level recorded in any of the tests was 4 units per ml. in two of the calves.

Conclusions

It is concluded from these limited observations that Distaquaine suspension may be used in both cows and calves by injecting intramuscularly at intervals of 24 hours. For therapeutic use in cows not less than 5,000 units per kg. is suggested as the initial dose and for calves approximately 10,000 units per kg. bodyweight, although in a small proportion of cases the serum penicillin level falls below the detectable minimum within 24 hours after these doses.

THE VETERINARY RECORD

September 30, 1950

THE BOVINE TUBERCULOSIS ERADICATION SCHEME

THE veterinary profession welcomes the long-awaited scheme for the eradication of bovine tuberculosis to be introduced on October 1st, 1950, which follows closely the recommendations repeatedly advanced by the Association over a long period of years in its efforts to bring some such scheme to fruition. The progressive steps legislated for in the plan of campaign indicate that this scheme initiates a long and arduous task for the profession—a task which can and will be lightened by the enthusiasm with which farmers and veterinary surgeons accept the duty which lies before them—to bring about the earliest possible removal of the scourge of bovine tuberculosis from the herds of this country.

The recent rapid increase in the number of attested herds and the many new applications for tuberculin tested licences throughout the country are good omens and show that the work of the veterinary profession in advancing the cause of eradication, the enthusiasm displayed by the National Farmers' Union at its headquarters, and the initiative displayed by the Milk Marketing Board in its efforts to re-awaken official interest when at one time it appeared to have lapsed, have all contributed to the acceleration of the appointed day for the introduction of this scheme.

The application of the tuberculin test demands mutual confidence between the veterinary surgeons, whole- and part-time, who are responsible for the work in the field, and the farmers concerned, together with the continuance of the friendly and understanding relations already established between them. The marked interest, which is self-evident in the livestock industry, is such that the scheme would appear likely to make much more rapid progress than is envisaged at the present time in official circles.

On many occasions in the past the National Veterinary Medical Association has emphasised the need for a programme of herd improvement and stressed that particular attention be paid to the indigenous types of the areas concerned. This can go hand in hand with eradication of tuberculosis, and veterinary surgeons can play a big part side by side with their colleagues in the N.A.A.S. Veterinary surgeons engaged in the field application of artificial insemination have a particular contribution to make in this sphere.

Looking to the future, total eradication of tuberculosis not only would prevent the danger of bovine type infection in man. It would bring enormous benefits to the dairying and beef industry in the saving of wastage and the increased production which must follow the control of this, the most serious of the insidious diseases of bovines in this country. The consumer will also benefit from the increased productivity which must follow and from the enhanced quality and quantity of the foodstuffs which will be available as the scheme progresses.

Acknowledgment.—We gratefully acknowledge the advice and practical encouragement received from Dr. J. Carmichael.

References

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The Animal Health Division has accepted a great responsibility in evolving this comprehensive scheme—which, though it will probably need minor amendments from time to time as a result of trial and error—appears essentially sound and practical. The fullest and most enthusiastic co-operation of the profession in all its branches is assured.

CLINICAL COMMUNICATION

A REVIEW OF FIFTY CASES OF RUMENOTOMY

R. S. NAISMITH, M.R.C.V.S.,

St. Andrews

Introduction

All these cases have been operated on within the last two and a half years. If the incidence of foreign bodies generally is as high as that found by me, it must be quite considerable, taking the country as a whole.

Of the 50 cases, 12 died shortly after operating, *i.e.*, within a month, and three were slaughtered later on economic grounds. The remaining 35 made good recoveries. I hasten to say that recovery depends far more on the cow and her general condition at the time of operating than on any skill on the part of the operator.

The causes of death were :—

(*a*) Post-operative sepsis (2)
(*b*) General debility (5)
(*c*) Chronic gastritis (2)
(*d*) Rupture of stitches (3).

Calving did not appear to be affected by operating at various stages of pregnancy. The oldest cow to be operated on was 14 years. She calved normally, a heifer calf, three months after operating, milked well during her next lactation and again had a heifer calf. The youngest animal to be attempted was ten months old, from which a piece of baler wire, 4½ in. long, was extracted and of which only ½ in. could be felt protruding into the cavity of the reticulum.

Twelve operations, nine successful, have been carried out on one farm. Extensive alterations to the steading and a defective hammer-mill were the cause of so much metal being ingested. On this same farm, several animals which have been checked over with the metal detector have been shown to be harbouring metal, but these animals are in good condition and have not had any digestive disturbances.

The Metal Detector

This piece of apparatus is a useful aid to diagnosis when properly used. As is well known, many animals harbour foreign bodies during their lives without any apparent harm, the value of the metal detector being restricted to confirmation of a diagnosis based on history and clinical signs and symptoms. In this connection, personally I find it of great use during the actual operation (*a*) for locating exactly the site of the foreign body and (*b*) making sure that all metal has been removed.

The main limitation of the metal detector is that it detects only ferrous metals. However, as wire and nails are the main offenders perhaps this is of little consequence.

In using the metal detector one must make sure that no external metal, *e.g.*, tubular stalls or re-inforced concrete, is near enough to cause interference. It may be necessary to have the animal removed to some open space where no inter-

ference is possible. One must also, of course, make sure that the contents of pockets, the head-phone, or the metal casing of valves and battery do not come close enough to the hand-piece to cause interference.

My method is to switch on, check the reaction in the ear 'phones by placing the hand-piece near some large metal object, then hold the hand-piece at arms-length and adjust the volume control until the " noise " just stops. The hand-piece is then applied to the cow just posterior to the olecranon process of the ulna ; it is brought back to a point immediately anterior to the udder—and so on, in parallel lines, to beyond the midline ventrally. This process is repeated on the right side of the animal. If no response is elicited I start again on the left side and work transversely across the sternum and backwards towards the udder. If a metallic object is located a check is made anteriorly, posteriorly, laterally and, by turning the hand-piece, ventrally over the floor. By adhering to this method one can be perfectly certain that when a reaction is elicited a piece of metal exists at the spot inside the animal, nearly always in the reticulum but occasionally in the rumen or abomasum. Conversely, one cannot be sure, because no reaction is elicited, that perhaps some non-ferrous metal or other material is, in fact, present.

Clinical Signs and Symptoms

These will be well known to most practitioners, but a few may be worthy of mention.

The commonest case is the one which has not been thriving for some time but is eating well and dunging normally, tuberculosis having been excluded.

Some animals appear in good condition but, at fairly short intervals have digestive upsets varying from merely being off food to violent bouts of kicking at the belly ; a drop in milk yield may also prevail. One is suspicious of the animal which lags behind the rest of the herd, perhaps " walking on its toes " ; or the animal which, if tied up, persistently fidgets about off one foot on to another, switching its tail and looking round at its side. It may stand with hind feet in the dung channel for long periods at a time.

In cases of traumatic pericarditis the jugular pulse may be observed and perhaps the " tinkling water " sound noted on auscultation. I myself have not been able to distinguish this latter with any degree of certainty.

Operative Technique

Many details have been omitted, as the technique does not differ much from well-known text-book descriptions.

Preparation of the Animal.—I do not starve the animal. If willing to eat, presumably it is getting some nourishment which will help it to withstand the shock.

Restraint.—In restive animals, one ounce of chloral hydrate is given by mouth on arrival at the farm. I find that most animals will stand reasonably still without any sedative and even without any restraint such as gripping the nostrils. The method of restraint must depend on the individual animal.

Preparation of Site.—The left flank and the back, from the second lumbar transverse process to the head of the second last rib, are clipped as closely as possible. This is generally done by the farmer before arrival. As I find cases heal up just as well without shaving, the clipped areas are now swabbed with liq. iodi fortis and anaesthesia proceeded with.

Anaesthesia.—The last rib is followed up until it can no longer be palpated, and midway between this point and the midline, is inserted 1 c.c. of 5 per cent. procaine, using a fine needle. This is repeated at a point above the anterior border of the second lumbar transverse process. With a wide-bore 2½-in. needle, 15 c.c. of 5 per cent. procaine is then injected at these points directing the needle downwards and forwards and moving it about during the injection. As I found during the first few operations that I was by no means adept at nerve blocking, I now inject 5 c.c. of 5 per cent. procaine with a wide-bore 1-in. needle at three equidistant points anterior to and parallel with the line of incision. Finally, 10 c.c. are infiltrated along the actual line of incision and all points of injection thoroughly massaged. Ten minutes are allowed for the anaesthetic to take effect.

Assistance.—I find it convenient to have two trained lay assistants, who, together with one farm man, are usually sufficient. Two men may be required if the animal is restive. My wife and receptionist have assisted me at all the operations and are of course equally useful at caesarean operations, etc. At this stage in rumenotomy, one fills the syringes with anaesthetic and hands them to me while the other cuts gut and tapes into required lengths and threads needles as well as preparing instruments. Needles are all threaded beforehand, so that no stops are necessary during the actual operation.

Prevention of Shock.—The animal is now given 10 c.c. Anthisan (May & Baker), intramuscularly and 400 c.c. calcium borogluconate P-M-D (Hewlett) subcutaneously with the object of counteracting shock and making up for loss of blood. The amount of blood lost externally seldom amounts to more than 6 oz.

Operation.—Hands and arms are thoroughly scrubbed with soap and water, rinsed in strong dettol solution and finally rinsed in a 1 : 1,000 solution of mercuric potassium iodide.

One assistant holds two knives, one for the skin and one for the muscles, peritoneum and stomach. Also the spray-gun (Arnold's), which is filled with local anaesthetic for use should the animal show signs of discomfort during the initial stages of the operation. The other assistant holds four 6-in., double-curved needles threaded with ¼-in. tape in lengths of about 10 in.

An incision of 8 to 10 in. is made in the skin, starting about 3 in. below the lumbar transverse process at a point midway between the last rib and ilium. The muscles are incised (in rib direction) for 2 in. or so, the forefinger of each hand being then inserted and the incision enlarged to 10 in. The peritoneum is incised in the same direction as the skin and the rumen exposed and grasped. Care must be taken when incising the peritoneum that the rumen is not punctured. The tapes are inserted about 1 in. apart and 8 in. between dorsal and ventral. A nick is made in the stomach to allow the escape of gas and it is then incised for a distance of 8 in., midway between the tapes. The rubber sheet with embroidery hoop in the centre, which has been steeping in strong dettol solution, is inserted and emptying of the rumen commenced. About two-thirds of the contents are removed, this generally being sufficient to allow of easy access to the reticulum and to ensure that no undue strain will be put on the stitches afterwards.

Location of Foreign Body.—If the foreign object already has been located by metal detector it is an easy matter to find and remove it. These objects are nearly always in the reticulum. The reticulum itself is easily found after a little practice and unless the animal has had a recent meal it will be empty. In 40 of the operations the foreign body was in the reticulum, in six it was in the abomasum and in four in the rumen. Foreign bodies in the rumen present no difficulty as the whole of the rumen can be explored. It is common to find a small heap of very fine sand on the floor of the rumen which it is probably better to remove. Having located the reticulum and foreign body therein, it is good policy to explore all the pockets and remove stones which are generally to be found there.

Foreign bodies in the abomasum are more difficult to locate. I prefer to use my left hand and arm for this, as one must first proceed anteriorly to the reticulo-omasal opening, laterally along the sulcus omasi to the omasal-abomasal opening and posteriorly into the fundic portion of the abomasum. In two animals, the reticulo-omasal opening was too small to permit the passage of my hand but in the other four it was relatively easy. The difficult part is in searching about among the folds of the mucous membrane, especially if the foreign body be thin wire. Stones, which I found here on two occasions, are easily located. I have tried using a large magnet for recovery of metal in both reticulum and abomasum but in my hands it has not been very successful.

It is surprising how small a cause can promote a serious disturbance in the animal. In one case, the animal had not been thriving too well, lagged behind the herd and finally "walked on her toes" and turned "all in one piece"; she was not eating and her milk yield had dropped. Operation revealed an object resembling an air-gun pellet, lodged in the most anterior portion of the reticulum. After a thorough search no more could be found and the operation was concluded. The animal made an uneventful and rapid recovery.

Having removed the foreign body, the rubber sheet is taken out and the edge of the stomach flushed with warm saline. Closure of the stomach wound is by two rows of Lembert continuous suture, using fairly thick gut: thin gut is apt to tear the stomach wall under strain of closing the wound. Muscles are brought into apposition by three equally spaced single stitches. The skin is sutured with tape, using two single stitches at points about 2 in. from the ends of the wound and one blanket stitch centrally.

The average time taken from arrival on the farm to departure is one hour.

After-treatment

Very little bulky food or water are allowed for four days. Concentrates and mashes are beneficial. A good clean, deep bed is necessary to prevent slipping.

I prefer not to visit the animal until a week after the operation unless sent for by the farmer. At this visit the lower portion of the wound is opened for drainage, if necessary, and any debris removed.

Skin stitches are removed after 14 days.

The Function of the Reticulum

The functions of the rumen, omasum and abomasum are thoroughly understood and accepted. The true function of the reticulum would appear, so far as I can ascertain, to give rise to some speculation.

My own theory is that one of the main functions, if not the specific function, of the reticulum is the separation of foreign material from the food and its subsequent retention. Its very structure and hornv, claw-like papillae suggest this. I have found that the reticulum can be stimulated to contract by digital pressure at its most anterior point. It occurred to me that possibly food as swallowed passed first into the reticulum and not into the rumen. As the reticulum fills with food it becomes reflexly stimulated to contract, squeezing down on the food mass and forcing it over the rumino-reticular fold into the rumen, any rough foreign material being retained. The reticulo-omasal opening would be closed by pressure.

To test this theory I have given two cows bran mashes one hour before being slaughtered. Each mash contained three brass screws about ½ in. long. On slaughtering; the reticulum was opened and in one cow the three screws were recovered; in the other only two could be found but it seemed to me to prove that the mash had gone direct into the reticulum. Had it gone direct into the rumen, the screws would have been lost in the general food mass and would presumably, as should other foreign bodies, have eventually descended to the lowest point of the rumen. Admittedly two animals are not sufficient to prove such a theory but neither did they disprove it.

I hope the foregoing will encourage anyone who has not attempted the operation, to do so in future with confidence.

ABSTRACTS

[Infectious Pneumonia of Pigs. Pullar, E. Murray (1948) *Aust. Vet. J.* **24.** 12.]

The disease is of unknown aetiology, but *Pasteurella suiseptica* is present in many cases. In Victoria outbreaks occur all the year round, with a marked increase in late spring and summer. It has no clear counterpart among diseases found in other countries. Mortality rate is under 10 per cent., and pigs of all ages are affected. The subclinical incidence of the disease is high, with an almost complete absence of symptoms, apart from a slight cough after exertion. Clinical cases exhibit some feverish symptoms, and a tendency to lie down. There is no evidence of any muscular stiffness, or pain, but there may be some congestion and a gummy exudation around the eye-lids. There is little loss of condition, except in cases where there is some secondary infection. Chronic cases show some unthriftiness, and when death takes place it follows coma.

The *post-mortem* lesions are frequently found along the lung lobe tips, especially those of the cardiac and apical lobes. The lesions vary from slight congestion to red and even grey hepatisation. It is common for the inflammatory process to involve the adjacent serous membranes, so that pleurisy and pericarditis are secondary.

The disease is said to be infectious, and has been experimentally transmitted by contact, and by exposure to atomised watery extracts from infected lungs. In the opinion of the author there are marked differences between this disease and influenza. Vaccination with a formalin-killed vaccine containing *P. suiseptica* and *Salmonella suipestifer* has been used on field trials. The number of cases showing red hepatisation was larger in the vaccinated group than in the controls.

A study of lung lesions showed that the lobes more commonly affected were those in which the bronchi tend towards the vertical as compared with those in which they are horizontal.

D. J. A.

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[Hypoglycaemia in Baby Pigs. Sampson, Jesse (1950) *Vet. Med.* **45.** 187-188.]

Basal hypoglycaemia is due to (i) a disturbance in the regulation of carbohydrate combustion, (ii) interference with storage and release of glycogen in the liver and muscles, (iii) an abnormal glucose loss by the kidneys. The symptoms produced are coma, and in some species, convulsions, due to insufficient glucose for the needs of the central nervous system. Disturbance of the nerve centres leads to an increased adrenalin output, through efferent impulses via the splanchnic nerves to the adrenals. This stimulates the sympathetic nerves of the liver and accelerates the conversion of glycogen to glucose. The

addition of this glucose to the blood is not sufficient to restore the blood sugar to its normal level. Injections of glucose will abolish the symptoms of hypoglycaemia.

In young pigs the condition is believed to be due to one of three possible causes:—

1. Failure of the sow's milk secretion.
2. Failure of the little pigs to ingest enough milk, due to some digestive disturbance.
3. Failure of the milk curd to pass on from the stomach to the intestine.

The condition may occur as a complication of some other disease, or independently. Agalactia in the sow a week before farrowing may result in this condition in the piglets, or scour in the little pigs may be a cause.

The condition develops in from 24 to 48 hours in newly born pigs given no nourishment. In pigs four or five days old the fatal condition takes about 150 hours to develop. Warmth helps to ward off fatalities. Apart from coma, low temperature, and some aimless movements, there are few symptoms, and none really of a distinct diagnostic nature. A quantitative chemical analysis of the blood for sugar is the only sure method of diagnosis. A favourable response to a glucose injection given before the little pig has been in coma for one hour is also diagnostic. Treatment consists of repeated glucose injections intraperitoneally, at four-, five- and six-hour intervals. 15 c.c. of a 5 per cent. sterile glucose solution in saline can be given, and has less tendency to cause dehydration than an injection of 3 or 5 c.c. of a 50 per cent. sterile glucose solution. Prevention requires attention to the diet of the sow and the provision to the piglets of artificial sow's milk to replace any deficiency in the supply from the sow. Injection of posterior pituitary extract is useful to induce lactation in the sow.

D. J. A.

REVIEW

[Nutrition of the Dog. CLIVE M. MCCAY (Professor of Nutrition, Department of Animal Husbandry, Cornell University). 2nd Edition, 1949, pp. xi + 337, price 27s. 6d. Ithaca, New York: Comstock Publishing Co., Inc.]

In the revised and enlarged second edition of his text-book Professor McCay has attempted the extremely difficult task of catering for a wide variety of readers. Whether he has altogether succeeded is a matter for conjecture. For the professional nutritionist the work is an extremely useful but by no means exhaustive source of references, and while the whole text is phrased in relatively simple language, the subject matter must for the most part be above the heads of the breeder. There is little doubt that within its covers there is to be found a greater aggregation of facts than is available in any single text in the English language, and for this reason alone all veterinary surgeons engaged in small-animal practice should have a copy on their bookshelves. While the author has made a brave attempt to correlate fundamental nutritional studies with everyday feeding of the dog, there are nevertheless considerable gaps so far as British experience goes, although these will appear less when the serious study of practical dog nutrition gets under way in this country.

There are 18 chapters, of which the main ones are devoted to carbohydrates, fats, proteins (two chapters), minerals, vitamins (two chapters), dog foods (three chapters), plant foods, " Blood and Bone," practical feeding, management and kennelling (two chapters), and " Parasites and Their Control," the last being written by Professor R. H. Udall, the well-known veterinary colleague of the author. In the earlier chapters the simple history of the main food ingredients is told, with illustrated references throughout to the dog. In the sections relating to dog foods British readers may be surprised at the amount of information available concerning American foods, and it is sincerely to be hoped that the products on our own market will come to bear such data and, what is even more important, that the particular requirements and deficiencies of dogs under British conditions will receive special study.

Little purpose would be served in discussing critically the abundance of scientific data that is referred to. From the clinician's standpoint there is much information of value and interest to be derived, but as the points applicable to practice are contained in the mass of other detail given, some searching is often necessary before obtaining the data required. Frequent reference is made to prepared dog feeds, a feature of American dog feeding which is relatively unfamiliar over here, and thus much of the text is of less value to the British practitioner or dog breeder than to their American colleagues. None the less, as has been stated previously, in the regrettable absence of a British standard work on canine nutrition, possession of this book is almost a " must " for the small-animal clinician.

QUESTIONS IN PARLIAMENT

IMPORTED POULTRY

Mr. HURD (September 18th) asked the Minister of Food if he is aware that dressed poultry are being exported to Portugal while other poultry are being imported from Hungary and Poland with serious risk of fowl pest infection; and if he will state Government policy in this matter.

Mr. WEBB: I am not aware of any United Kingdom exports of dressed poultry to Portugal or elsewhere. No poultry has been imported from Hungary since the end of 1949, and poultry imported from Poland is subject to arrangements made with the Polish authorities to reduce to a minimum the risk of carcases infected by fowl pest being sent to this country.

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AGRICULTURE (EXPANSION PROGRAMME)

Mr. HURD (September 18th) asked the Minister of Agriculture if he has given any guidance to the county agricultural executive committees on the contribution which British agriculture is expected to make to strengthening the nation's defences.

Mr. T. WILLIAMS: Yes. As recently as September 7th I addressed a personal letter on this subject to all chairmen of county agricultural executive committees, in which I stressed the greater need, in the present situation, to attain in full our programme of expansion, including the development of grassland, the achievement of a higher level of self-sufficiency and the maintenance of fertility in the soil.

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EXPERIMENTS (LIVING ANIMALS)

Mr. PETER FREEMAN (September 14th) asked the Secretary of State for the Home Department how many experiments have been performed on living animals with and without anaesthetics in 1949; and what are the corresponding figures of experiments carried out for the purpose of cancer research only.

Mr. EDE: In 1949, 154,369 experiments with anaesthetics were performed on living animals, of which 24,448 were carried out for the purpose of cancer research. The corresponding figures for experiments without anaesthetics are 1,555,314 and 50,895.

WEEKLY WISDOM

To the rising generation I would say two things. First, in these days when freedom is greatly curtailed, and regulation almost universal, do not lose your own individuality; it is your most precious possession; and next, never be content with what is mediocre and ugly. You may sometimes have to accept it, but never be content with it.—Her Majesty, the Queen. (Address at the 500th anniversary celebrations of the foundation of St. Salvator's College, St. Andrews University.)

NOTES AND NEWS

Diary of Events

Oct. 3rd.—Meeting of the Crop Protection Panel of the Agriculture Group of the Society of Chemical Industry, at the Geological Society, Burlington House, Piccadilly, W.1. Dr. E. A. Parkin (Pest Infestation Laboratory, Slough): "Biological Tests of Insecticides for Stored Products Insects," 5 p.m. Visitors welcomed.

Oct. 5th.—Meeting of the Central Division, N.V.M.A., at the Royal Veterinary College, Camden Town, 6 p.m.

Oct. 5th.—Meeting of the Western Counties Division, N.V.M.A., at Exeter (Rougemont Hotel), 2 p.m.

Oct. 6th.—Meeting of the Sussex Division, N.V.M.A., at Brighton (Old Ship Hotel), 2.30 p.m.

Oct. 10th.—Commencement of Course of three Special University (of London) Lectures in Veterinary Science, at the Royal Veterinary College, by Professor F. W. Rogers Brambell, D.Sc., F.R.S. (See Notice.)

Oct. 10th.—Scientific Meeting of the Zoological Society of London, Regent's Park, N.W.8, 5 p.m.

Oct. 13th.—General Meeting of the South Wales Division, N.V.M.A., at Carmarthen. (See Notice.)

Oct. 17th.—Meeting of the Southern Counties Division, N.V.M.A., at Winchester.

Oct. 18th.—Meeting of the Scottish Metropolitan Division, N.V.M.A., at Edinburgh (Moredun Institute), 3.30 p.m. (The meeting will follow the James Clark Memorial Unveiling Ceremony.)

Oct. 19th.—Meeting of the Hertfordshire and Bedfordshire Division, N.V.M.A., at St. Albans (70, Holywell Hill), 2.30 p.m.

Oct. 19th.—Meeting of the South-Eastern Division, N.V.M.A., at Tunbridge Wells (Royal Mount Ephraim Hotel), 2.30 p.m.

Oct. 20th.—Meeting of the Biochemical Society, in the National Institute for Medical Research, The Ridgeway, Mill Hill, London, N.W.7, 11 a.m.

N.V.M.A. Council and Committee Meetings

The next Council and Committee Meetings of the Association will be held in London on October 30th, 31st, and November 1st.

The time-table is as follows:—

*Monday, October 30th, at 36, Gordon Square, W.C.*1.

2 p.m.—Organising Committee.

4 p.m.—Home Appointments Committee.

*Tuesday, October 31st, at 36, Gordon Square, W.C.*1.

9.30 a.m.—Parliamentary and Public Relations Committee.

10.30 a.m.—Veterinary State Medicine Committee.

2.30 p.m.—General Purposes and Finance Committee.

*Wednesday, November 1st, at the Connaught Rooms, Great Queen Street (off Kingsway), W.C.*2.

11 a.m.—Council Meeting.

As previously announced, an N.V.M.A. Conference on Artificial Insemination, open to members of the profession interested in this subject, will be held in the Auditorium of the Wellcome Research Institute on *Thursday, November 2nd*, at 11 a.m.

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CONFERENCE ON ARTIFICIAL INSEMINATION

Members intending to be present at the Association's Conference on Artificial Insemination to be held on Thursday, November 2nd, 1950, in the Auditorium, The Wellcome Research Institute, Euston Road, London, N.W.1, are asked to notify headquarters N.V.M.A. *not later than Friday, October 27th.* Numbers are required for catering purposes.

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N.V.M.A. PRESIDENT'S VISIT TO DENMARK

Mr. S. F. J. Hodgman, President of the N.V.M.A., accompanied by Mrs. Hodgman, travelled by air to Copenhagen and Aarhus on Saturday last, to represent the Association at the annual meeting of the Danish Veterinary Association.

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PERSONAL

Birth.—Shuja.—On September 17th, 1950, at Combined Military Hospital, Karachi (Pakistan), to Mary (*née* Tipler), wife of J. D. Shuja, M.R.C.V.S., a daughter—Sarah Maryam.

Marriage.—Toop—Marriott.—On September 2nd, 1950, at St. John's Church, Surrey Road, Bournemouth, Bryan Robert Vincent Toop, M.R.C.V.S., elder son of Mr. and Mrs. R. E. M. Toop, of Sutton, Surrey, to Vivienne Marriott, only daughter of Mr. and Mrs. H. W. Marriott, of Bournemouth, Hants.

* * * * *

J. M. L. PENHALE

An Appreciation

The passing of Jack Penhale will leave a gap in the ranks of our Ministry staff difficult to fill.

He came of an illustrious line of veterinary surgeons and for generations his family had been associated with the profession, so that his daughter is the fourth in succession to quality. But even before the days of a qualification his forbears had practised as cow doctors and followed the art of farriery for many years.

As it often happens in persons in whom the veterinary tradition is so strong, Penhale had a curious sympathy with animals evidenced by the manner in which he handled and spoke to them, and they in turn gave to him a confidence which had to be seen to be believed: many, perhaps, may not appreciate this subtle bond but to those with eyes to see it was there just the same and is particularly discernible in those whose roots lie deep in veterinary soil.

During the whole of his Service career, and he was 62 years of age when he died, he never lost his natural ability so far as the diagnosis and treatment of animal disease was concerned and it would be no exaggeration to maintain that he would, at any time, have made his mark in some other sphere of professional activity: not only that, but his practical knowledge of farming operations and of livestock generally was remarkable in its range, and there were few aspects regarding them about which he could not express a considered opinion.

To casual acquaintances he was reserved and sometimes appeared diffident—but how different to his circle of intimate friends, most of whom had known him since his early days on our staff. They knew well his ability as a veterinary surgeon within the widest meaning of the term; they knew his keen sense of humour, almost Puckish at times, his countless stories, his intense love of his home and family life and of his many kindly deeds. Fools he could never suffer gladly.

During his illness it must have been a great comfort to him to know that his daughter, Barbara, in whose career he took such a passionate interest, was carrying on the traditions of his distinguished family which he himself had so worthily maintained.

All members of the Animal Health Division will extend to his wife and daughter an expression of their deepest sympathy.

A. V. F.

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The International Horse Show, 1950

It will be a great day for all horse lovers, and I think will show a return to normality when the attendance at the White City for the International Horse Show nearly approximates that of an average dog night at the same venue—but the day is not yet. Nevertheless, this event draws an increasing number of people and I should not be surprised if this year's show just about breaks even.

On the whole the weather was good, though for the dressage on the Sunday afternoon many of the competitors were subjected to soaking rain. The outstanding performance was that of "Zigeunerbaron"—a nine-year-old chestnut gelding, the entry of Frau Hilde Hellmann and ridden by Colonel Felix Burkner; for a big horse and a big man these two gave a remarkably smooth display with great suppleness and extension.

Some excellent entries were forward in most of the riding classes, though some were disappointing. Our colleague Mr. F. Beckett, F.R.C.V.S., M.F.H., had the task, jointly with Mr. Oliver Gilbey, of judging the Heavyweight Cob Class. They had the courage, as one would expect of them, to reverse the decisions of previous big shows.

The Winston Churchill Cup, awarded by popular acclamation to the Best Riding Horse, was won by the very attractive chestnut Arab stallion—"Count Dorsaz"—bred and exhibited by Miss G. M. Yule. The runner-up was Mr. W. H. Cooper's chestnut heavyweight hunter gelding—"Mighty Atom," a prominent winner during the past two seasons.

The jumping was of an exceptionally high standard throughout the show. The first cup—the Selby Cup—was won by Miss Iris Kellett, who had the only two clear rounds on "Rusty" and "Starlet." Iris Kellett also obtained a clear round in the Princess Elizabeth Cup, which she won last year, but she was beaten on time by two seconds by 17-year-old Jill Palethorpe riding 20-year-old "Silver Cloud" in her first international competition. Iris Kellett also won in brilliant style the Six Bars Competition.

The Moss Bros. Cup Competition was an epic; no fewer than seven competitors had a clear round. Four of these—Mr. E. Oliver's "Talisman," the Spanish horse "Frisar"—ridden by Lieut.-Colonel Nogueras, Mr. W. White's "Nizefella" and Lieut.-Colonel H. Llewellyn's famous "Foxhunter" each had two further clear rounds. At the third jump-off the bar of the wall was 6 ft. and the triple 5 ft. 8 in.; three of the four—"Frisar," "Nizefella" and "Foxhunter" again had clear rounds. Again the bar was raised to 6 ft. 6 in.; "Foxhunter" cleared all three fences, "Nizefella" also cleared all three, but with that backward kick which he often gives he dislodged the top bar over the wall. "Frisar" had the misfortune to lower the second fence, which he had previously cleared four times, and then went on to clear the wall.

The King George V Gold Challenge Cup Competition was as exciting as usual, but many who witnessed the actual competition missed the big thrill which occurred during the qualifying round when "Foxhunter," who ultimately won the cup in brilliant fashion, only just qualified by virtue of a refusal (three faults) against two other competitors with four faults.

In the competition proper the most perfect round was the first one of all by Colonel Llewellyn riding "Kilgeddin"; this grand old horse met every fence just right and gave each one many inches—truly a magnificent example. Two other clear rounds were obtained—"Kinsale," ridden by Capt. Tubridy, of Ireland, and "Foxhunter." At the jump-off "Foxhunter" got a second clear round and "Kilgeddin" and "Kinsale" each got four faults.

The International Team Competition for the Prince of Wales Cup was another very exciting contest. Spain were fancied as the probable "winner" and at the end of the first round Spain and France were leading, but in the second round "Foxhunter," "Tankard" and "Nizefella" all got clear rounds—an unprecedented achievement—putting Great Britain top, with an aggregate of 15 faults, Ireland being second with 27 faults, and Spain third with 28 faults.

The *Country Life* and Riding Cup Competition on Friday morning was noteworthy for the large number of casualties which occurred. It was a "time" competition and one heard rumours that many of the competitors who came to grief had attended a very good party the night before—convincing proof that one has to have a clear head if one has to make split second decisions!

In the *Daily Mail* Cup Competition Great Britain again sprang a surprise; the course was the stiffest ever used in the competition for this cup, and there were two jumps-off, in the last of which the upright gate was 5 ft. 6 in., the bar in the treble 5 ft., and the triple 5 ft. 3 in. with a spread of 6 ft. "Foxhunter," "Sheila," "Craven A," "Nizefella," "Frisar," "Grand Prix," and "Quoniam" all had clear rounds; on the first jump-off "Quoniam," "Frisar" and "Sheila" were clear again; in the second jump-off, against time, "Sheila," used only to jumping under B.S.J.A. rules, and brilliantly ridden by Mr. Shamus Hayes, made exceptionally fast time between fences and by cutting corners at great speed, completed a faultless round in 42·8 seconds. "Quoniam" also had a clear round in 48·8 seconds, whilst "Frisar" incurred four faults. Truly a magnificent performance to finish the 1950 Show.

A popular parade was made twice each day by "Golden Miller" and "Insurance"—Miss Dorothy Paget's veteran racehorses. These two animals, which are inseparable companions, were in excellent condition, despite their years—"Golden Miller" is 23 years old, and his legs show none of the signs of wear which one would expect to find in a horse having so much to his credit—the Grand National in 1934 and the Cheltenham Gold Cup five years in succession from 1932 to 1936 inclusive.

A Cavalcade of Horsemen through the Ages was interesting, but one wonders whether the effect was worth all the tremendous amount of hard work, effort and expense which the parade entailed. Certainly, if viewed as a substitute for last year's display by Col. Podhajsky, it was a poor second.

The outstanding feature and high-light of the show was the State Drive round the arena in an open carriage by Their Majesties the King and Queen. This gracious act and beautiful turn-out evoked tumultuous applause and will long be remembered by all who saw it.

H. W. S.-B.

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WORLD CONGRESS FOR THE PROTECTION OF ANIMALS

THE HAGUE—AUGUST 27TH-31ST, 1950

(Contributed)

The opening of the Congress was visited by the Queen of Holland.

Delegates representing 111 associations from 27 countries attended.

The representation from Great Britain was as follows:—

England	15	societies.
Scotland	3	societies.
Northern Ireland	1	society.
Eire	1	society.
Total	20	societies.

Twenty subjects were dealt with as shown below:—

	Subjects.	*No. of papers submitted.*
1.	Quarantine	1
2.	Oil-birds. (Danger to birds from oil discharged by ships at sea)	4
3.	Transport of animals by land, sea and air	3
4.	Performing animals	2
5.	Zoological gardens	1
6.	Legislation for prevention of cruelty to animals	5
7.	Slaughter problems	2
8.	Eye-flaps	—
9.	International co-operation and propaganda	2
10.	Docking of horses and dogs; ear cropping of dogs	1
11.	Ambulance service for animals	—
12.	Draught dogs and chained dogs	1
13.	Vivisection	9
14.	Police protection of animals	1
15.	Protection of animals in own country	6
16.	Killing of domestic animals in rural districts	1
17.	Animal rescue homes	2
18.	Hunting problems	—
19.	Vegetarianism	1
20.	Education and the protection of animals	7

The total number of papers submitted was 49, and these originated from 34 different societies.

In the arrangements for the Congress it was unfortunate that papers, which had been previously circulated, were not taken as read, and that the writer of each read his paper from the rostrum and the paper was repeated in at least one other language. This procedure occupied a great deal of time unnecessarily. Despite the fact that the Congress had three sessions per day, there was little or no time available for discussion of any of the subjects, nor for any of the many gross misrepresentations in some of the papers to be refuted.

Supporters of anti-vivisection took a prominent part in the proceedings.

Included in the delegates were the following veterinary surgeons: Professor Carlström, Sweden; Dr. Von During, Germany; Professor C. F. van Oijen, Holland; Professor Beyers, Holland; Dr. E. J. Voute, Holland; Dr. J. D. Endonan Schmidy, Holland; Mr. W. Watt, Scotland.

Three veterinary students were present, namely, Messrs. Schwarty and Sothern, Glasgow; Mr. Fell, London.

The conference agreed to the formation of a World Association of Societies for the Protection of Animals.•

• In this connection the following notice has been received [*Editor*]:—

"At the recent International Congress at The Hague a World Organisation was set on foot for united action by the societies in all countries, and to provide a channel for assistance of one organisation by another, either material or by way of information. In furtherance of this World Organisation a meeting of all organisations working for animals in this country is called for.

"The Convention of British Animal Protection Societies is being held at the Caxton Hall, Westminster, on April 23rd, 24th and 25th, 1951.

"Leading authorities in many branches of animal welfare work will be speaking freely, providing a unique opportunity for animal lovers to learn more about these subjects.

"Early booking is advisable and forms may be obtained from the Convention Office, 8, Clifford Street, London, W.1. Any society which has not received details of the Convention is also invited to communicate."

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WORSHIPFUL COMPANY OF FARRIERS

At the September Court of the Worshipful Company of Farriers Mr. Herbert Fenton was installed a Master of the Company for 1950-51, with Major G. A. Warley, Professor J. B. Buxton, and Mr. S. R. Walker as Wardens. At the same Court Mr. L. C. F. Robson, the Clerk of the Company, was elected also to be an Assistant in recognition of his services.

ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

SWINE FEVER:

Kent.—Thos. Foat (Ash) Ltd., Goldstone Farm, Ash, Canterbury, Kent (disease at Laurel House, Cop Street, Ash, Canterbury, Kent) (Sept. 16th).

Lancashire.—C. D. Cryer, Woodhouse Farm, Little Thornton, Blackpool, Lancs (Sept. 16th); Brookside Farm, Chapel Road, Penketh, Warrington, Lancs (Sept. 19th); Breck Farm, Poulton-le-Fylde, Blackpool, Lancs, and Parkstyle Farm, West Derby, Liverpool, 11 (Sept. 23rd).

Leicestershire.—Hollygate Farm, Stapleford Park, Melton Mowbray, Leicestershire (Sept. 23rd).

Lincoln (*Parts of Lindsey*).—Field Lane, Morton, Bourne, Lincs; Moor Farm, Scawby, Brigg, Lincs; Southorpe Farm, Blyton, Gainsborough, Lincs (Sept. 16th); Eversleigh, Westwoodside, Haxey, Doncaster, Lincs (Sept. 23rd).

Nottinghamshire.—Forest Town, Mansfield, Notts (Sept. 16th); No. 2, Hatfield Street, Retford, Notts (disease at Piggeries, Smallholdings, Babworth Road, Retford, Notts) (Sept. 18th); 31, Ridgeway Road, Warsop, Mansfield, Notts (Sept. 23rd).

Shropshire.—Lea Hall Farm, Harmer Hill, Shrewsbury, Shropshire (Sept. 16th).

Yorkshire (*West Riding*).—Butterbush Farm, Doncaster Road, Conisborough, Doncaster, Yorkshire; 21, Green Lane, Barnborough, Doncaster, Yorkshire (disease at Green Lane Allotments, Barnborough, Doncaster, Yorkshire) (Sept. 16th); Moorfield Hill Farm, Meltham, Huddersfield, Yorkshire (Sept. 18th); 16, Washington Street, Mexborough, Yorks (disease at Cherry Tree Allotments, Mexborough, Yorks (Sept. 20th); 14, Doncaster Road, Woodlands, Doncaster, Yorkshire (Sept. 21st); Black Bull Hotel, Skipton Road, Kettlesing, Harrogate, Yorkshire; 18, Cowper Road, Mexborough, Yorkshire (carcases at Doncaster Corporation Abattoir) (Sept. 22nd); Jordonthorpe Hall Farm, Norton, Sheffield (Sept. 23rd).

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SCIENTIFIC CONFERENCE ON MILK PRODUCTION

A scientific conference on milk production, to be held in Paris during November 28th to 30th, is being organised by the Centre National de Coordination des Etudes et Recherches sur la Nutrition et l'Alimentation. The conference will follow the lines of those on bread and on food fats held in 1948 and 1949 respectively. The programme is in three sections: production and genetics; production and feeding; and pathology and hygiene of production. Further particulars of the "Journées Scientifiques de la Production du Lait" can be obtained from the Centre National de Coordination des Etudes et Recherches sur la Nutrition et l'Alimentation, 71, Boulevard Péreire, Paris (17e).

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CATTLE MARKET CONGESTION HAMPERS VETERINARY INSPECTION

Prosecuting in a case at Chippenham Police Court, Supt. H. Edwards suggested that it was difficult, if not impossible, to carry out adequate veterinary inspection in Chippenham Market owing to the prevailing congestion.

George Long, farmer and cattle dealer, of Burton-on-Trent, was fined £5 for failing to isolate a cow suffering from tuberculous emaciation, and £5 for failing to give notice of a cow apparently suffering from tuberculosis. He was also ordered to pay £5 costs. Defendant contended the cow had no external symptoms of tuberculosis.

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STUD GOAT SCHEME, 1950-51

The British Goat Society has now published its list of goats accepted under the Stud Goat Scheme for the 1950-51 season. The scheme aims at improving by means of selective breeding the productive quality of milch goats kept by smallholders, cottagers, and others of similar position, and is administered by the British Goat Society under the approval of, and with financial assistance from, the Ministry of Agriculture and Fisheries. The fee charged for each service must not exceed 7s. 6d. The Stud Goat List can be obtained, post free, from the Secretary, British Goat Society, Diss, Norfolk.

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the N.V.M.A.

CYSTICERCUS BOVIS

Sir,—I think Mr. Priestley is to be congratulated on the very interesting figures which he publishes in this week's *Record*.

The incidence of this infestation is evidently much greater than previously published figures suggest. In that respect there is no room for complacency, and we would be quite wrong in failing to give this matter its proper emphasis. At the same time we might be equally wrong in drawing any exaggerated conclusions from the facts so far established. I think Mr. Priestley would be the last to claim that his figures represent the maximum infestation of the animal population—it is reasonable to assume that a more thorough investigation than he has been able to give this matter might show a much higher percentage of animals affected. But I submit that is only the beginning of the enquiry which is necessary—the next important step is to establish the degree of infestation in each case, and further, what degree of infestation constitutes a danger to public health. My feeling is that while the position to-day gives no ground for complacency, at the same time there is no cause for grave alarm. My expectation is that we might see a gradually increasing incidence of this infestation until it reaches a peak (we may have reached the peak now) to be followed by a gradual recession until the outbreak reaches a minimum or gradually dies out. I base my assumption on the natural course of events—a heavy introduced infestation followed by wide dissemination among animals; if the majority of affected animals can be detected in their passage through the abattoirs then the dangers of reinfestation of the human population will be minimised, and the course of the outbreaks shortened.

But Mr. Priestley's letter makes one other point which I feel should be underlined, that is, the value of abattoir material and statistics in the investigation of animal diseases and their control. Unfortunately the present organisation of the meat inspection service is not designed for this purpose, but it does appear to be the logical line of development.

Yours faithfully,

DAVID E. ORR,
Chief Veterinary Officer, Manchester.

September 25th, 1950.

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INTESTINAL ADHESIONS TO THE UTERINE STUMP

Sir,—Despite the kindly reticence of Messrs. Startup and Fleck in the matter, I suspect the lack of reports on the above condition to be due rather to a cause unflattering to the operator than to its rarity.

In the past three years three of these cases have come to my notice and another is under observation at the present moment.

The subject of the first was a bitch upon which a pyometra had been performed a month previously. On examination I recognised the condition that had arisen and advised the owner to consult the veterinary surgeon who operated. I heard later that the bitch was destroyed.

The second case followed a pyometra hysterectomy performed by myself when I was out of catgut. I re-operated and found two portions of bowel, omentum, and uterine stump joined in a mass of reaction tissue in the centre of which was an abscess and infected silk ligature. The bowels were eased free (expressing the muscular layer of the bowel during the process, the intestinal peritoneum remaining on the affected area), all infected tissue was cut out and omentum incised through the healthy part, which was resutured by catgut to a healthy stump. Burroughs Wellcome intramammary penicillin was smeared on the damaged bowel and placed in the peritoneal cavity. Recovery was uneventful.

The third case was also a pyometra hysterectomy performed at my surgery by a V.S., who "didn't believe in catgut." In this instance three different portions of the bowel omentum as well as a portion of the bladder the size of a half-crown, were adhering to the uterine stump. (Frequent micturition and straining led us to know about the bladder involvement before operation.) In the centre of this tangle was an abscess and an infected silk suture. Drastic surgery was carried out and recovery was again uneventful, due in my opinion, to the liberal use of intramammary penicillin intraperitoneally.

One case under observation at the moment also includes the bladder and probably will be operated upon shortly. I wonder

how many of these cases, prior to the advent of penicillin and sulphonamide therapy, died from acute peritonitis before localisation of the reaction could take place.

Three simple precautions will, in my opinion, obviate this risk. The use of absorbable suture material for all internal ligatures, the fixation of the gastro-splenic omentum to the uterine stump (which at the same time protects the intestines from the midline incision) and the use of penicillin as a common-sense safeguard. I also maintain (I realise with some audacity) that no silk type of ligature is sterile after it has been tied under the operative conditions of general practice, and that, even if the body or penicillin has managed to control the infected suture, it will remain as a permanent irritant to cause trouble at some future date.

Finally, one other case. I had to operate for a stone in a dachshund last year. Two years previous to that another stone had to be removed at the R.V.C., London. I used a midline incision and found a mass of bowel adhering to the flank where the previous incision had been, and also to the portion of bowel where the stone had been removed. All this had to be broken down before the stone could be reached. The owner reports that the dog has never been so well.

In my experience, therefore, bowel adhesions are by no means rare.

Yours faithfully,
SIDNEY S. NYE.

230, South Street,
Romford, Essex.
September 10th, 1950.

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TORSION OF THE LIVER IN A SOW

Sir,—A large black sow suckling her three weeks' old third litter showed sudden symptoms of acute pain and disinclination to move.

At *post-mortem* examination I found that the left lateral and left central lobes of her liver had undergone torsion through 180° in a clockwise direction (viewed from the visceral surface). The affected lobes had ruptured and there was extensive peritonitis throughout the abdomen.

Yours faithfully,
MICHAEL R. W. LEWIS.

4, Bridge Street,
Stratford-on-Avon.
September 16th, 1950.

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PRESCIENCE OF JOHN PENBERTHY

Sir,—Recent suggestions in *The Veterinary Record* on the subjects of human tuberculosis and infertility of livestock recall to me two very interesting observations that fell from the lips of Professor John Penberthy, almost half a century ago, when he was Professor of Veterinary Medicine at Camden Town:—

(1) On infertility he said that, in his opinion, nothing was more conducive to it than over-feeding and lack of exercise.

(2) On tuberculosis he said that he was not at all sure but that the elimination of tuberculosis from our herds would be followed by an increase of human tuberculosis. He held that our continually imbibing minute doses of bovine tuberculosis very likely produced in us a considerable immunity to the human variety in much the same way that cow pox immunised us against small pox. In both opinions he may have been nearer the truth than we in those days realised.

Yours faithfully,
THOMAS LISHMAN.

23, Queens Gate Gardens,
London, S.W.7.

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TREATMENT OF CANINE BLEPHARITIS

Sir,—For some time I have experienced difficulty in treating canine blepharitis unassociated with distemper. Symptoms include marked swelling and pain of the eyelids with a purulent discharge and frequently traumatic keratitis caused by the patients rubbing their eyes.

The ineffectiveness of yellow oxide of mercury ointment 1 per cent. in these cases presumably is due to a collection of pus in the ducts and glands themselves, resulting from infection of the meibomian glands.

Having read a report by Hogg (*Vet. Rec.* (1949.) **61.** 441) on a case of keratitis treated with Viacutan (silver dinaphthylmethane disulphonate) solution where a stimulating and penetrating antiseptic was required, I decided to try a cream containing 1 per cent. of this organic silver compound in these obstinate cases of blepharitis.

The first case treated was a Cocker Spaniel dog aged 18 months. A "spear grass" had penetrated behind the outer canthus of the right eye, causing considerable pain. Severe inflammation and infection resulted from the dog "pawing" its eye. The day after the injury was inflicted the foreign body was removed under a local anaesthetic and the eye was bathed with zinc sulphate lotion. Twenty-four hours later the upper lid was very swollen and painful with a purulent discharge.

Viacutan cream was then applied to the eye twice daily. This appeared to alleviate the pain appreciably, as the dog no longer attempted to rub its eye. The continued use of the cream resulted in an uneventful recovery within six days.

More recently I have obtained even better results in these cases of blepharitis and conjunctivitis with a cream containing 0·1 per cent. Penotrane—the phenylmercuric analogue of Viacutan. This cream appears to alleviate pain rapidly and at the same time its antibacterial and antimycotic properties are not impaired by the presence of pus.

In view of this experience, I should be interested to learn if others have obtained similar results with Viacutan and Penotrane creams in refractory ophthalmic infections.

Yours faithfully,
E. A. BUNN
(Veterinary Practitioner).

"The Vines,"
75, Redbridge Lane,
Ilford, Essex.
September 21st, 1950.

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JAMES CLARK MEMORIAL

Sir,—It may be recalled that on different occasions during the past two years or so I have invited the members of the veterinary profession to contribute to a fund which would be used to put Clark's unmarked burial place in the Kirkyard of the Canongate, Edinburgh, into some state of decency and there to erect a mural tablet to his memory.

The ceremony of unveiling the memorial tablet on October 18th will be performed by Professor Thomas Dalling, President of the Royal College of Veterinary Surgeons. The Right Hon. Sir Andrew Murray, Lord Provost of Edinburgh, and the Rev. R. Selby Wright, Minister of the Canongate Kirk, will also take part in the proceedings. All those who wish to attend—and it is hoped that there will be a large gathering of members from both sides of the Border—are invited to assemble in the vestibule of the Canongate Kirk between the times of 2.15 and 2.30 on the afternoon of October 18th.

Yours faithfully,
J. RUSSELL GREIG.

Animal Diseases Research Association,
Moredun Institute,
Gilmerton, Edinburgh, 9.
September 22nd, 1950.

DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT, 1937 (PART IV).

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Fowl Pest	Parasitic Mange*	Sheep Scab	Swine Fever
Aug. 16th to 31st, **1950**	8	3	1	—	—	42
Corresponding period in—						
1949	8	2	5	—	—	—
1948	5	—	10	—	2	1
1947	4	—	20	—	6	1
Jan. 1st to Aug. 31st, **1950**	258	19	102	—	19	93
Corresponding period in—						
1949	130	13	357	—	29	5
1948	67	—	240	1	33	23
1947	67	103	716	1	41	20

NOTE.—The figures for the current year are approximate only.
* Excluding outbreaks in Army Horses.

Tuberculosis (Attested Herds) Schemes

The number of Attested Herds, *i.e.*, herds officially certified as free from Tuberculosis as at August 31st, 1950, was as follows:—

ENGLAND	WALES	SCOTLAND	TOTAL (GREAT BRITAIN)
23,490	14,949	13,142	51,581